Subchapter 4.7—Disk Arrays

4.7.1—HP StorageWorks Virtual Array 7000 Family: VA7100, VA7110 and VA7410

Introduction

The HP StorageWorks VA7000 Family arrays that support MPE/iX include the VA7100, VA7110 , and VA7410 arrays. Where sections are specific to a particular array, they are called out. If a section is not specifically called out, it is common to all.

For the latest configuration information, please refer to the SPOCK website (internal) or the Partnership Website (external):

Spock Website:
- For VA7410 array: http://nss-streams.corp.hp.com/xp_documentation/va7410_docs.htm
- For VA7100 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7100_docs.htm
- For VA7110 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7110_docs.htm

Partnership Website:
- http://partner.americas.hp.com/

Enterprise Virtual Array (EVA)

For information on EVA support, please visit the following URLs:

For Installation and Configuration and Release Notes
- In Spock, go to "Disk Array Connectivity" and select: HP StorageWorks EVA Technical Documentation
- Go there directly with the following URL:
  http://h18000.www1.hp.com/products/storageworks/enterprise/documentation.html

For Disk Array Connectivity
- HP StorageWorks EVA Product Index
- Go there directly with the following URL:
  http://h18000.www1.hp.com/products/storageworks/enterprise/index.html

Overview

VA7100 Overview

The HP StorageWorks Virtual Array 7100 is a disk storage system that holds from 4 to 15 disk drives. The array has scalable capacities from 72 GB to 270 GB (211 GB usable) with all 18-GB disk drives and from 144 GB to 540 GB (428 GB usable) with all 36-GB disk drives and from 292 GB to 1.1 TB with 73-GB disk drives. Capacities and spindle speeds can also be mixed. The array requires a dual controller configuration to support MPE/iX. At least one controller must be attached to a management station running the HP StorageWorks Command View SDM software. Each controller has two DIMM slots available to hold NVRAM. The NVRAM is used for read/write caching and for storing array memory maps.

The Virtual Array 7100 can operate in either RAID 1+0 mode or AutoRAID mode, which eliminates the requirement for the system administrator to understand and configure RAID levels. AutoRAID dynamically adapts to the system's workload, optimizing performance and cost. Users will find configuration significantly easier than other array products, since RAID levels don't need to be configured or managed. The VA7100 supports one redundancy group, and all drives belong to that group. Using Virtual Storage Array (VSA) technology, when configured in AutoRAID mode the array controller automatically selects RAID 1+0 (disk striping and mirroring) or RAID 5DP (RAID 5 Double Parity) depending on the usage patterns of the data.

RAID 5DP provides superior data redundancy by protecting against the simultaneous failure of two member disks by using independent error correction schemes.

The VA7100 is designed to communicate with multiple hosts and multiple systems, otherwise known as heterogeneous support. Any combination of the supported operating systems: HP-UX, MPE/iX, Windows NT, Solaris, AiX, NetWare, Windows 2000, and Linux can be used. Two different protocols, or host port behaviors, are used by the array to communicate with the operating systems: one protocol for Windows/Linux/other and another for HP-UX. Depending on the firmware level of the VA7100, another was added for MPE/iX. The Windows/Linux host port behaviors must be configured in the array for communication to take place with any or all four supported operating systems on a controller. When changing the port protocol to Windows/Linux it does support concurrent operation with Windows/Linux and HP-UX. The VA7100 provides simultaneous access by all of the supported operating systems on a LUN-by-LUN basis. Each LUN operates appropriately given the description of the operating system requirements.

The VA7100 can be configured to utilize an active hot spare feature. An active hot spare is a portion of the disk array capacity reserved to perform a rebuild. This feature requires the use of two additional disk units in the array. An active hot spare ensures that the disk array can maintain data redundancy if one or two disks fails. Until it is needed, the disk array uses the active hot spare storage space as RAID 1+0 capacity, which improves array performance. The active hot spare storage capacity does not sit idle; it is used to increase the disk array performance until the storage is needed.

The chassis will accommodate up to 15 low-profile 3.5-inch hard disk drives loaded from the front. The array requires 3 EIA units (3U) in height, which allows 10 units to be placed in a standard 1.6-meter rack. The rear of the 3 EIA rack mountable chassis also includes two 1-GB Fibre Channel controllers, dual power supplies and dual fan modules. The redundant power supply and fan components are combined into a single module. All modules are hot swappable.

The array can be connected to one or more hosts, hubs, or switches via an optical Fibre Channel (FC) interface with 1 gigabit per second transfer rates. It can be ordered in factory-racked, field-rackable, or desk-side configurations. Factory-racked products are pre-configured in the HP Rack/System E racks. Field-rackable products can be racked in HP racks or in Compaq 9000 racks.

The VA7100 is supported by HP's Instant Support Enterprise Edition (ISEE). HP's online diagnostic and resolution capability securely delivers remote reactive services that quickly resolve problems, proactive service that anticipate and prevent downtime due to computing issues, and value-added services to help monitor, manage and maintain global IT networks. A minimum level hardware support upgrade of same day is required. It is included with the VA for the first year (in addition to the warranty).

VA7110 Overview

The HP StorageWorks Virtual Array 7110 is a disk storage system that supports from four to 45 disk drives (two additional enclosures with 15 disks in each). The array has scalable capacities from 72 GB to 810 GB (211 GB usable) with all 18-GB disk drives and from 144 GB to 1.6 TB with all 36-GB disk drives and from 292 GB to 3.2 TB with 73-GB disk drives and from 584 GB to 6.5 TB with 146-GB disk drives. Capacities and spindle speeds can also be mixed. The array requires a dual controller configuration to support MPE/iX. At least one controller must be attached to a management station running the HP StorageWorks Command View SDM software. Each controller has two DIMM slots available to hold NVRAM. The NVRAM is used for read/write caching and for storing array memory maps.

The Virtual Array 7110 can operate in either RAID 1+0 mode or AutoRAID mode, which eliminates the requirement for the system administrator to understand and configure RAID levels. AutoRAID dynamically adapts to the system's workload, optimizing performance and cost. Users will find configuration significantly easier than other array products, since RAID levels don't need to be configured or managed. The VA7110 supports one redundancy group, and all drives belong to that group. Using Virtual Storage Array (VSA) technology, when configured in AutoRAID mode the array controller automatically selects RAID 1+0 (disk striping and mirroring) or RAID 5DP (RAID 5 Double Parity) depending on the usage patterns of the data. RAID 5DP provides superior data redundancy by protecting against the simultaneous failure of two member disks by using independent error correction schemes.

The VA7110 is designed to communicate with multiple hosts and multiple systems, otherwise known as heterogeneous support. Any combination of the supported operating systems—HP-UX, Windows NT, Solaris, AiX, NetWare, Windows 2000, MPE/iX, and Linux can be used. Two different protocols, or host port behaviors, are used by the array to communicate with the operating systems: one protocol for Windows/Linux/other and another for HP-UX. The Windows/Linux host port behaviors must be configured in the array for communication to take place with any or all four supported operating systems on a controller. When changing the port protocol to Windows/Linux it does support concurrent operation with Windows/Linux and HP-UX. The VA7110 provides simultaneous access by all of the supported operating systems on a LUN-by-LUN basis. Each LUN operates appropriately given the description of the operating system requirements.

The VA7110 can be configured to utilize an active hot spare feature. An active hot spare is a portion of the disk array capacity reserved to perform a rebuild. This feature requires the use of one or two additional disk units in the array. An active hot spare ensures that the disk array can maintain data redundancy if one or two disks fails. Until it is needed, the disk array uses the active hot spare storage space as RAID 1+0 capacity, which improves array performance. The active hot spare storage capacity does not sit idle; it is used to increase the disk array performance until the storage is needed.

Each enclosure will accommodate up to 15 low-profile 3.5-inch hard disk drives loaded from the front. The array requires three EIA units (3U) in height (per enclosure), which allows ten units to be placed in a standard 1.6-meter rack. The rear of the EIA rack mountable chassis also includes two 1-GB fibre channel controllers, dual power supplies and dual fan modules. The redundant power supply and fan components are combined into a single module. All modules are hot swappable.

The array can be connected to one or more hosts, hubs, or switches via an optical fibre channel (FC) interface with 1 or 2 gigabit per second transfer rates (the default setting is 1 gigabit). It can be ordered in factory-racked, field-rackable, or desk-side configurations. Factory-racked products are pre-configured in the HP Rack/System E racks. Field-rackable products can be racked in HP racks or in Compaq 9000 racks.

The VA7110 is supported by HP's Instant Support Enterprise Edition (ISEE). HP's online diagnostic and resolution capability securely delivers remote reactive services that quickly resolve problems, proactive service that anticipate and prevent downtime due to computing issues, and value-added services to help monitor, manage and maintain global IT networks. A minimum level hardware support upgrade of same day is required. It is included with the VA for the first year.

The revision numbering for firmware for the VA7110 has changed. The revision numbering now consists of a string of 4 ASCII characters (the HP designation has gone away). For example, a revision code of "X123" represents the following:
- "X" is a single capital letter (A – Z) designating the platform
- "1" is a single number or capital letter (0-9, A-Z) designating a major FW revision
- "2" is a single number or capital letter (0-9, A-Z) designating a minor FW revision
- "3" is a single number or capital letter (0-9, A-Z) designating a sub-minor FW revision

VA7410 Overview

The HP StorageWorks Virtual Array 7410 is a Fibre Channel (FC) disk storage system that supports from ten to 105 disk drives. The VA7410 has two FC ports on each controller. The VA7410 is comprised of two types of enclosures, each three EIA units high: the virtual array controller enclosure (A6183A/AZ) and the disk system enclosure (A6214A/AZ) also referred to as the disk enclosure or the JBOD (Just a Bunch Of Disks) enclosure. In addition, pre-defined SKUs are available to facilitate integrated arrays. The array consists of one controller enclosure and one to six disk enclosures, with scalable capacities from 181 GB to 1.90 TB (using 18-GB 15K rpm disk drives), 364 GB to 3.82 TB (using 36-GB 10K rpm disk drives), 720 GB to 7.67 TB (using 73-GB 10K rpm disk drives), or 1.46 TB to 15.33 TB (using 146-GB 10K rpm disk drives). Capacities and spindle speeds can also be mixed throughout the array.

Both enclosures include dual power supplies with built-in dual blowers, and accommodate up to 15 low-profile 3.5-inch native fibre channel (FC) disk drives in the front. The controller enclosure also includes dual redundant 1 or 2-Gbps FC capable array controller cards and the disk enclosure also includes dual redundant 1- or 2-Gbps link controller cards for back-end connections to the controllers. All field replaceable units are hot swappable. The array controller cards, however, must be replaced offline if the OS does not support controller failover.

The VA7410 can operate in either RAID 1+0 mode or AutoRAID mode. These data protection levels are user selectable at the time of initial array installation. Using Virtual Storage Array (VSA) technology, when configured in AutoRAID mode the array controller automatically selects RAID 1+0 (disk striping and mirroring) or RAID 5DP (RAID 5 Double Parity) depending on the usage patterns of the data. This protection scheme eliminates the requirement for the system administrator to understand and configure RAID levels.

RAID 5DP provides superior data redundancy by protecting against the simultaneous failure of two member disks by using independent error correction schemes. Users will find configuration significantly easier than other array products, since RAID levels don't need to be configured or managed. The VA7410 supports two redundancy groups, which provides for physical data path separation of the two groups of LUNS.

The VA7410 is architected to communicate with multiple hosts and operating systems, otherwise known as a simultaneous heterogeneous environment. For details on supported operating systems, please refer to the Spock Website and Partnership Website:

Spock website:
- For VA7410 array: http://nss-streams.corp.hp.com/xp_documentation/va7410_docs.htm
- For VA7400 array: http://nss-streams.corp.hp.com/xp_documentation/va7400_docs.htm
- For VA7110 array: http://nss-streams.corp.hp.com/xp_documentation/va7110_docs.htm
- For VA7100 array: http://nss-streams.corp.hp.com/xp_documentation/va7100_docs.htm

Partnership website:
- http://partner.americas.hp.com/

One host port behavior is initially set in controller firmware, and then heterogeneous support for all other operating systems is enabled through software in a host port behavior table. The controller default host port behavior is set for HP-UX. The VA7xxx products are managed by the HP Command View SDM host-resident software. A one-host license to use for HP StorageWorks Command View SDM is included with each VA7410. Currently HP StorageWorks Command View SDM runs native on HP-UX, Windows NT, Windows 2000 and Red Hat Linux 6.2, 7.1. Installations on any of the other supported operating systems will require a dedicated management station running one of the aforementioned operating systems to be in the data path of the VA7410 (i.e. in the switched fabric).

The VA7410 can be configured to use an active hot spare feature. An active hot spare is a portion of the array capacity reserved to perform a rebuild. This feature requires the use of additional disk drives in the array. Users can select from 0, 1, or 2 active hot spares. An active hot spare ensures that the array can maintain data redundancy if one or two disks fail. Until it is needed, the array uses the active hot spare storage space as RAID 1+0 capacity, which improves array performance. The active hot spare storage capacity does not sit idle; it is used to increase the array performance until the storage it is needed.

The VA7410 can be connected to one or more hosts, hubs, or switches via an optical fibre channel (FC) interface with OS-dependant, 1- or 2-Gbps transfer rates. The default factory setting is 1-Gbps. It can be ordered in factory-racked and field-rackable configurations. Factory-racked products are pre-configured in the HP Rack/System E racks. Field-rackable products can be racked in HP racks or in Compaq 9000 racks.

The VA7410 is supported by HP's Instant Support Enterprise Edition (ISEE). HP's online diagnostic and resolution capability securely delivers remote reactive services that quickly resolve problems, proactive service that anticipate and prevent downtime due to computing issues, and value-added services to help monitor, manage and maintain global IT networks. A minimum level hardware support upgrade of same day is required.

New Firmware Revision Code Designation for VA7410

Note: The release firmware for the VA7410 is "A100".

The revision numbering for firmware for the VA7410 has changed. The revision numbering now consists of a string of 4 ASCII characters (the HP designation has gone away). For example, a revision code of "X123" represents the following:
- "X" is a single capital letter (A – Z) designating the platform
- "1" is a single number or capital letter (0-9, A-Z) designating a major FW revision
- "2" is a single number or capital letter (0-9, A-Z) designating a minor FW revision
- "3" is a single number or capital letter (0-9, A-Z) designating a sub-minor FW revision

Important VA7410/DS2405 Notes:
- On the VA7410 only the DS2405 is supported. For the VA7410, HP StorageWorks Command View SDM software version 1.05 or later is required.
- Disk drive firmware may need to be upgraded. For more information, please check the Service Note server at the following site and do a search on the VA family via product numbers to see all available and relevant service notes: http://snserver.mayfield.hp.com/ServiceNotes/Snwebsite/SearchbyProdNum.asp
- Additionally, on the DS2405, the LCC FC loop speed must be set to 2-Gbps (this is the factory default). If needed, refer to the DS2405 User Guide on setting LCC speed.
- The DS2405 is not supported connected directly to a switch.
- If you are upgrading to a VA7410 from an array with DS2400 JBODs, the DS2400 JBODs must also be upgraded to DS2405 JBODs.

Product Features

Integrated VA arrays contain two (2) controllers. The array controllers contain the intelligence and functionality required to manage the operation of the entire array. The array functions include:
- Implementing HP Virtual Storage Technology to ensure optimum performance and cost-efficient data storage
- Managing all communication between the host and the disk drives via single or dual controller Fibre Channel arbitrated loops
- Maintaining data integrity by automatically correcting any data errors that occur
- Rebuilding the array in the event of a disk failure
- Monitoring the operation of all hardware components, including the controller itself
- Alerting the host in the event of a component failure

The use of two controllers protects the array against a single controller failure. Both controllers may be active, allowing a possible increase in performance, while providing data redundancy.

Each configured array controller includes the following components:
- One (1) or two (2) Dual Inline Memory Modules (DIMMs), purchased separately if an additional Virtual Array Controller is added
- One (1) Battery
- One (1) Early Warning Switch

Performance, Throughput and Capacity

Item	Value
Throughput Host Interface VA7100	100 MB/s FC
Throughput Host Interface VA7110	200 MB/s FC
Throughput Host Interface VA7400	200 MB/s FC
Throughput Host Interface VA7410	200 MB/s FC
Drive Interface	100 MB/s FC
Disk System Capacity VA7100	1095 GB raw capacity
Disk System Capacity VA7110	6.5 TB raw capacity
Disk System Capacity VA7400	7.6 TB GB raw capacity
Disk System Capacity VA7410	15.3 TB GB raw capacity
Storage Controller	High-performance Virtual Array Controller
Disk Drive Capacity	18 GB, 36.4 GB 73 GB and 146 GB (Note the 146 GB drive is for the VA7110 only
Rotational Velocity	10K RPM and 15K RPM
Disk Drive Transfer Rate	10K = 26 MB/s (or better); 15K = 38 MB/s (or better)
Disk Drive Average Seek Time	10K = 4.7 ms (or better) Read, 5.2 ms (or better) Write; 15K = 3.6 ms (or better) Read, 4.2 ms (or better) Write
Disk Drive Average Latency	10K = 2.99 ms, 15K = 2.00 ms

VA7110 Disk Enclosure Specifications (DS2405)

Physical Specifications

Height	Width	Depth	Net Weight Max	Shipping Weight Max
5 in	17.6 in	20 in	84.5 lbs	101.5 lbs
128 mm	448 mm	508 mm	38.3 kg	46 kg

Electrical Specifications

Parameter	Value
Voltage (Auto-Ranging)	100-127 VAC; 200-240 VAC
Frequency	50/60 Hz
Current (Maximum; 2 power inputs)	8.2 A @ 100 VAC, 3.4 A @ 200 VAC
Inrush Current (Peak)	3.92 A @ 269 VAC
Power Consumption	473 W @ 120 VAC, 457 W @ 240 VAC
Heat Dissipation	1443 BTU/hr
VA Rating (Maximum Configuration)	473 VA @ 120 VAC, 457 VA @ 240 VAC

Environmental Specifications

Parameter	Operating Range	Recommended Range	Non-Operating
Temperature	5° to 35° C (41° to 95° F)	20° to 25.5° C (68° to 78° F)	–40° to 70° C (-40° to 158° F)
Temperature Gradient	20° C (36° F) per hour	20° C (36° F) per hour	20° C (36° F) per hour
Relative Humidity (Non-Condensing)	15% to 80% @ 28° C (dry bulb)	30% to 50% @ 28° C (dry bulb)	5% to 95% @ 65° C (149° F)
Shock	4 g, 11 ms (20 low-impulse pulses)	N/A	20 g, 30 ms trapezoidal (non-transport) 1-inch edge drops per side (transport)
Vibration	0.21 g rms, 5- to 500-Hz random	N/A	2.09 g rms, 5- to 500-Hz random 0.5 g peak, 5- to 500-Hz swept sine
Altitude	0 ft to 10,000 ft (0 to 3,048 m)	0 ft to 10,000 ft (0 to 3,048 m)	0 ft to 15,000 ft (0 to 4,572 m)
Acoustic (ISO 9296)	8.0 bels	8.0 bels	N/A

Regulatory Compliance

Parameter	Specification
Radiated and Conducted Emissions	FCC Class A, EN 55022: 1998, CISPR-22: 1997 Level A, and GB9254: 1998
Immunity	EN 55024: 1998/CISPR-24: 1997
Harmonic Current	IEC 61000-3-2: 1998/EN 61000-3-2: 1995 + A14
Voltage Fluctuations and Flicker	IEC 61000-3-3: 1994/EN 61000-3-3: 1995
Product Safety	EN 60950: 1991, Second Edition + A1, A2, A3, and A4 CAN/CSA - C22.2 No. 60950-00, Third Edition UL 1950: Third Edition IEC 60825-1: 1993 + A1/EN 60825-1: 1994 + A11 Class 1 (Laser/LED) GB4943: 1995

Warranty

Included with every VA7000 Family Array:
- Warranty: 2-year, 8×5, same-day, 4-hour on-site response for hardware with a 2-year 8×5 phone-in assistance, 2-hour response for HP StorageWorks Command View SDM phone-in assistance (PIA)

Required with purchase:
- VA Family Hardware and Software: Installation service—H4726A
- Pre-installation review
- Hardware installation
- Software enablement
- LUN Design and Implementation
- Customer documentation and orientation
- VA Family Software: 8×5 Phone-in-Assistance (H4403A, Support Pack)

Instant Support Enterprise Edition Support (ISEE)

What is Instant Support Commercial

HP Instant Support is a unique combination of web-based self-service diagnostics and knowledge base access and is offered as a free value-added service for HP desktop computers, mobile computers, technical workstations, and PC servers.

ISC Value Proposition

HP Instant Support automates and speeds the resolution of computing problems, freeing customers from time-consuming diagnostic chores and returning them to more productive business-critical tasks.

Links of Interest
- Instant Support Commercial (European server)— http://instantsupport.europe.hp.com/motivedocs/hpinstantsupport.html
- www.hp.com/go/instantsupport
- Instant Support (desktop/printers)—WW Marketing Page http://www.hp.com/go/instantsupport
- HPCS eDelivery EMEA—http://hpsedelivery.europe.hp.com/
- HP Business Support—http://h20000.www2.hp.com/bizsupport/index.jsp
- Troubleshooting Resources—http://www.hp.com/hps/itsol/suppt_troubleshooting.html

Specifications

VA7100 Specifications

Racked Product Physical Specifications

Height	Width	Depth	Net Weight Minimum
5.0 in	17.6 in	26 in	75 lbs
128 mm	448 mm	660 mm	34 kg

Deskside Product Physical Specifications

Height	Width	Depth	Net Weight Minimum
19 in	16.5 in (box (6.5) + base (10)	26 in	105 lbs
483 mm	419 mm	660 mm	47.6 kg

Deskside and Racked Product Electrical Specifications (VA7100 only)

Parameter	Value
Voltage	100-127 and 200-240 VAC (auto-ranging)
Frequency	50/60 Hz
Current (Maximum)	7.2 Amps RMS (2 power inputs)
Inrush Current (Peak)	36 Amps
Power Consumption	670 Watts
Heat Dissipation	196 BTU
VA Rating (Maximum Configuration)	720 VA

Deskside/Racked Product Environmental Specifications

Parameter	Operating Range	Recommended Range	Non-Operating
Temperature	5° to 35° C	20º C to 25.5º C (68º F to 78º F)	–40° to 70° C
Temperature Gradient	20° C (36° F) per hour	20° C (36° F) per hour	20° C per hour
Relative Humidity (non-condensing)	10% to 80% @ 28° C (wet bulb)	30% to 50% @ 28° C (wet bulb)	10% to 90% @ 28° C (wet bulb)
Shock	4 g, 11 ms half sine	N/A	4 g, 11 ms half sine
Vibration	0.21g rms, 5- to 500-Hz random	N/A	2.09 g rms, 5- to 500-Hz random 0.5-g peak, 5- to 500-Hz swept sine
Altitude	0 ft to 10,000 ft	0 ft to 10,000 ft	0 ft to 15,000 ft
Acoustic (ISO 9296)	8.0 bels	8.0 bels	N/A

Deskside/Racked Product Regulatory Compliance

Parameter	Specification
Radiated and Conducted Emissions	FCC Class A, EN 55022: 1998, CISPR-22: 1997 Level A, and GB9254: 1998
Immunity	EN 55024: 1998/CISPR-24: 1997
Harmonic Current	IEC 61000-3-2: 1998/EN 61000-3-2: 1995 + A14
Voltage Fluctuations and Flicker	IEC 61000-3-3: 1994/EN 61000-3-3: 1995
Product Safety	EN 60950: 1991, Second Edition + A1, A2, A3, and A4 CAN/CSA - C22.2 No. 60950-00, Third Edition UL 1950: Third Edition IEC 60825-1: 1993 + A1/EN 60825-1: 1994 + A11 Class 1 (Laser/LED) GB4943: 1995

VA7110 and VA7410 Controller Enclosure Specifications

Physical Specifications

Height	Width	Depth	Net Weight Max	Shipping Weight Max
5 in	17.6 in	26 in	34 lbs	130.1 lbs
128 mm	448 mm	660 mm	41.8 kg	59.0 kg

Electrical Specifications

Parameter	Value
Voltage (Auto-Ranging)	100-127 VAC, 200-240 VAC
Frequency	50/60 Hz
Current (Maximum; 2 power inputs)	8.2 A @ 100 VAC, 3.6 A @ 200 VAC
Inrush Current (Peak)	36 A
Power Consumption	670 W
Heat Dissipation	196 BTU/hr
VA Rating (Maximum Configuration)	720 VA

Environmental Specifications

Parameter	Operating Range	Recommended Range	Non-Operating
Temperature	5° to 35° C (41° to 95° F)	20º to 25.5º C (68º to 78º F)	–40° to 70° C (-40° to 158° F)
Temperature Gradient	20° C (36° F) per hour	20° C (36° F) per hour	20° C (36° F) per hour
Relative Humidity	15% to 80% @ 28° C (dry bulb)	30% to 50% @ 28° C (dry bulb)	10% to 90% @ 28° C (dry bulb)
Shock	4 g, 11 ms half sine	N/A	4 g, 11 ms half sine
Vibration	0.21 g rms, 5- to 500-Hz random	N/A	2.09 g rms, 5- to 500-Hz random 0.5 g peak, 5- to 500-Hz swept sine
Altitude	0 ft to 10,000 ft (0 to 3,048 m)	0 ft to 10,000 ft (0 to 3,048 m)	0 ft to 15,000 ft (0 to 4,572 m)
Acoustic (ISO 9296)	8.0 bels	8.0 bels	N/A

Regulatory Compliance

Parameter	Specification
Radiated and Conducted Emissions	FCC Class A, EN 55022: 1998, CISPR-22: 1997 Level A, and GB9254: 1998
Immunity	EN 55024: 1998/CISPR-24: 1997
Harmonic Current	IEC 61000-3-2: 1998/EN 61000-3-2: 1995 + A14
Voltage Fluctuations and Flicker	IEC 61000-3-3: 1994/EN 61000-3-3: 1995
Product Safety	EN 60950: 1991, Second Edition + A1, A2, A3, and A4 CAN/CSA - C22.2 No. 60950-00, Third Edition UL 1950: Third Edition IEC 60825-1: 1993 + A1/EN 60825-1: 1994 + A11 Class 1 (Laser/LED) GB4943: 1995

DS2405 Disk Enclosure Specifications

Physical Specifications

Height	Width	Depth	Net Weight Max	Shipping Weight Max
5 in	17.6 in	20 in	84.5 lbs	101.5 lbs
128 mm	448 mm	508 mm	38.3 kg	46 kg

Electrical Specifications

Parameter	Value
Voltage (Auto-Ranging)	100-127 VAC; 200-240 VAC
Frequency	50/60 Hz
Current (Maximum; 2 power inputs)	8.2 A @ 100 VAC, 3.4 A @ 200 VAC
Inrush Current (Peak)	3.92 A @ 269 VAC
Power Consumption	473 W @ 120 VAC, 457 W @ 240 VAC
Heat Dissipation	1443 BTU/hr
VA Rating (Maximum Configuration)	473 VA @ 120 VAC, 457 VA @ 240 VAC

Environmental Specifications

| Parameter	Operating Range	Recommended Range	Non-Operating
Temperature	5° to 35° C (41° to 95° F)	20° to 25.5° C (68° to 78° F)	–40° to 70° C (-40° to 158° F)
Temperature Gradient	20° C (36° F) per hour	20° C (36° F) per hour	20° C (36° F) per hour
Relative Humidity (Non-Condensing)	15% to 80% @ 28° C (dry bulb)	30% to 50% @ 28° C (dry bulb)	5% to 95% @ 65° C (149° F)
Shock	4 g, 11 ms (20 low-impulse pulses)	N/A	20 g, 30 ms trapezoidal (non-transport) 1-inch edge drops per side (transport)
Vibration	0.21 g rms, 5- to 500-Hz random	N/A	2.09 g rms, 5- to 500-Hz random 0.5 g peak, 5- to 500-Hz swept sine
Altitude	0 ft to 10,000 ft (0 to 3,048 m)	0 ft to 10,000 ft (0 to 3,048 m)	0 ft to 15,000 ft (0 to 4,572 m)
Acoustic (ISO 9296)	8.0 bels	8.0 bels	N/A

Regulatory Compliance

Parameter	Specification
Radiated and Conducted Emissions	FCC Class A, EN 55022: 1998, CISPR-22: 1997 Level A, and GB9254: 1998
Immunity	EN 55024: 1998/CISPR-24: 1997
Harmonic Current	IEC 61000-3-2: 1998/EN 61000-3-2: 1995 + A14
Voltage Fluctuations and Flicker	IEC 61000-3-3: 1994/EN 61000-3-3: 1995
Product Safety	EN 60950: 1991, Second Edition + A1, A2, A3, and A4 CAN/CSA - C22.2 No. 60950-00, Third Edition UL 1950: Third Edition IEC 60825-1: 1993 + A1/EN 60825-1: 1994 + A11 Class 1 (Laser/LED) GB4943: 1995

Figure 4.7.1.1 HP StorageWorks Virtual Array 7000 Family – Front View

Figure 4.7.1.2 HP StorageWorks Virtual Array 7100
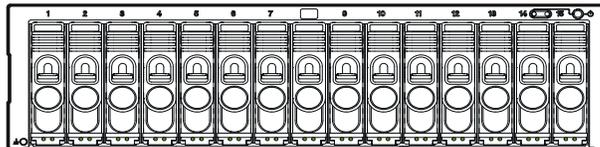
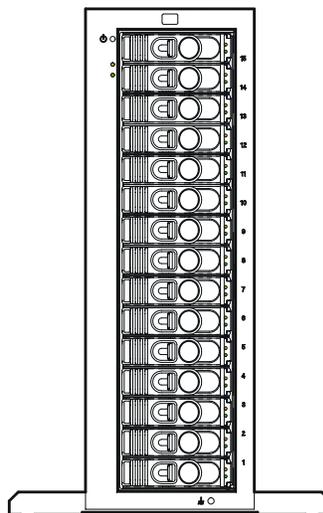**Figure 4.7.1.3 HP StorageWorks Virtual Array 7100—Deskside Configuration**
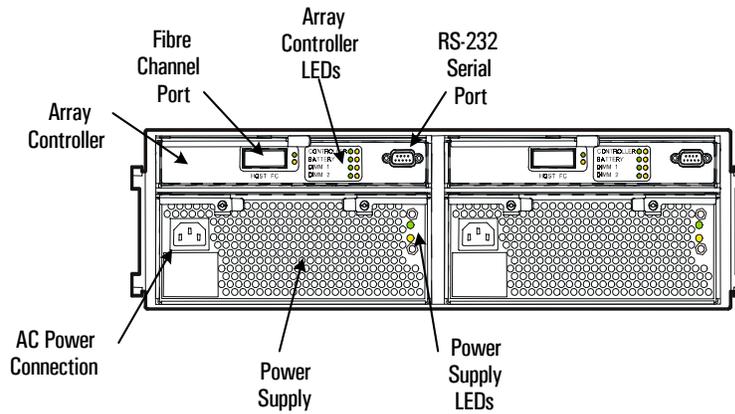
Figure 4.7.1.4 VA7100—Rear View

Figure 4.7.1.5 StorageWorks VA7110—Front and Rear View
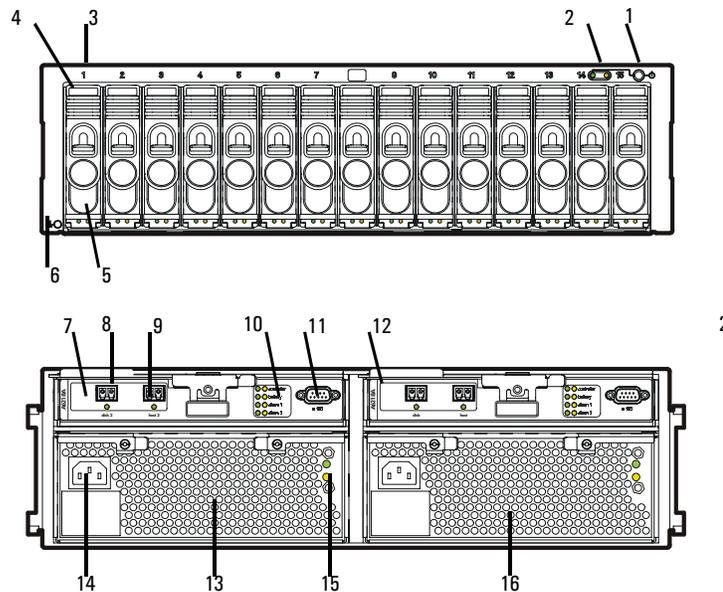

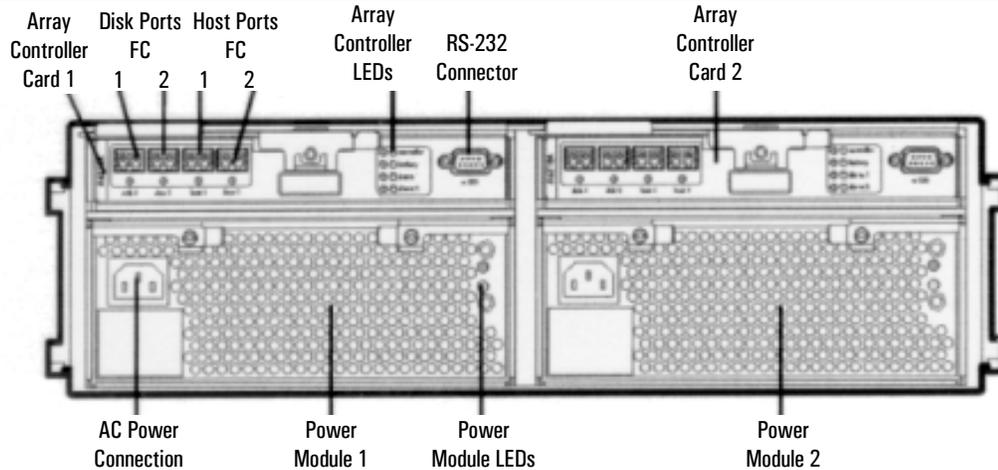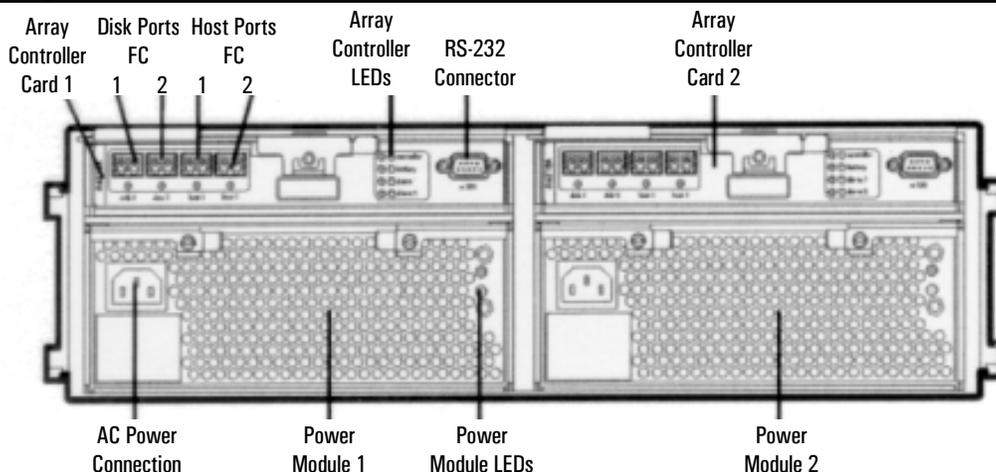
Figure 4.7.1.6 VA7410—Rear View

Figure 4.7.1.7 StorageWorks DS2405—Rear View

Hardware Ordering Information

VA7100 Hardware Ordering Information

The following codes define the suffixes on product numbers: A = Field Racked, AE = diskless enclosure (field disk integration), AZ = Factory Racked.

Order drives separately from the Enterprise Module section using the 0D1 option for integration. "AE" products are shipped as diskless enclosure only no integration (disks are ordered separately and field installed).

Product Number	Option Number	Description
VA7100 Field RK SKU		
A6261A		Predefined SKU - VA7100 with Dual Controller, 2 GBICs, 256-MB Cache
A6262A		Predefined SKU - VA7100 with Dual Controller, 2 GBICs, 512-MB Cache (1×512MB DIMM)
A6263A		Predefined SKU - VA7100 with Dual Controller, 2 GBICs, 1024-MB Cache (2×512MB DIMM)
A6183A		Field upgrade product. Select Virtual Array Controller (one or two) and cache and disk options separately (factory installed). Includes filler for controllers and disks.
A6188A	0D1	Virtual Array Controller no memory installed
A6185A	0D1	256-MB Cache for Virtual Array Controller, 1×256MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6186A	0D1	512-MB Cache for Virtual Array Controller, 1×512MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6187A	0D1	2×512MB Cache for Virtual Array Controller, 2×512MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6192A	0D1	36-GB 10K RPM FC HDD Module
A6193A	0D1	36-GB 15K RPM FC HDD Module
A6194A	0D1	73-GB 10K RPM FC HDD Module
A7288A	0D1	73-GB 15K RPM FC HDD Module
A6203A	0D1	Optical Gigabit Interface Circuit (GBIC)
A3583A	0D1	2-meter FC fiber optic cable M/M multimode SC-SC
A3531A	0D1	16-meter FC fiber optic cable M/M multimode SC-SC
A3735A	0D1	50-meter FC fiber optic cable M/M multimode SC-SC
A3736A	0D1	100-meter FC fiber optic cable M/M multimode SC-SC
C7529A	0D1	2-meter FC fiber optic cable M/M duplex LC-SC
C7530A	0D1	16-meter FC fiber optic cable M/M duplex LC-SC
C7534A	0D1	FC fiber optic coupler F/F SC-SC
C7540A	0D1	FC adapter kit (includes C7529A and C7534A)

Product Number	Option Number	Description
VA7100 Factory Rack		
A6261AZ		Predefined SKU - VA7100 with Dual Controller, 2 GBICs, 256-MB Cache
A6262AZ		Predefined SKU - VA7100 with Dual Controller, 2 GBICs, 512-MB Cache (1×512MB DIMM)
A6263AZ		Predefined SKU - VA7100 with Dual Controller, 2 GBICs, 1024-MB Cache (2×512MB DIMM)
A6183AZ		Field upgrade product. Select Virtual Array Controller (one or two) and cache and disk options separately (factory installed). Field Installed. Includes enclosure assembly, user manual, and 2 power supplies, filler panels for controllers and disks.
A6188A	OD1	Virtual Array Controller no memory installed
A6185A	OD1	256-MB Cache for Virtual Array Controller, 1×256MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6186A	OD1	512-MB Cache for Virtual Array Controller, 1×512MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6187A	OD1	2×512MB Cache for Virtual Array Controller, 2×512MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6192A	OD1	36-GB 10K RPM FC HDD Module
A6193A	OD1	36-GB 15K RPM FC HDD Module
A6194A	OD1	73-GB 10K RPM FC HDD Module
A7288A	OD1	73-GB 15K RPM FC HDD Module
A6203A	OD1	Optical Gigabit Interface Circuit (GBIC)
A3583A	OD1	2-meter FC fiber optic cable M/M multimode SC-SC
A3531A	OD1	16-meter FC fiber optic cable M/M multimode SC-SC
A3735A	OD1	50-meter FC fiber optic cable M/M multimode SC-SC
A3736A	OD1	100-meter FC fiber optic cable M/M multimode SC-SC
C7529A	OD1	2-meter FC fiber optic cable M/M duplex LC-SC
C7530A	OD1	16-meter FC fiber optic cable M/M duplex LC-SC
C7534A	OD1	FC fiber optic coupler F/F SC-SC
C7540A	OD1	FC adapter kit (includes C7529A and C7534A)
VA7100 Modules		
A6183AE		Field upgrade product. Select Virtual Array Controller (one or two) and cache product separately (factory installed). Field Installed. Includes enclosure assembly, user manual, and 2 power supplies. This product is shipped without disks or controllers/cache and includes filler for controllers and disks.
A6261AE		Predefined SKU - VA7100 with Dual Controller, 2 GBICs, 256-MB Cache
A6262AE		Predefined SKU - VA7100 with Dual Controller, 2 GBICs, 512-MB Cache (1×512-MB DIMM)
A6263AE		Predefined SKU - VA7100 with Dual Controller, 2 GBICs, 1024-MB Cache (2×512-MB DIMM)
A6188A		Virtual Array Controller no memory installed
A6185A		256-MB Cache for Virtual Array Controller, 1×256MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6186A		512-MB Cache for Virtual Array Controller, 1×512MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6187A		2×512MB Cache for Virtual Array Controller, 2×512MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6192A		36-GB 10K RPM FC HDD Module
A6193A		36-GB 15K RPM FC HDD Module
A6194A		73-GB 10K RPM FC HDD Module
A7288A	OD1	73-GB 15K RPM FC HDD Module
A6196A		Deskside cabinet for HP StorageWorks VA7100
A6203A		Optical Gigabit Interface Circuit (GBIC)
A3583A		2-meter FC fiber optic cable M/M multimode SC-SC
A3531A		16-meter FC fiber optic cable M/M multimode SC-SC
A3735A		50-meter FC fiber optic cable M/M multimode SC-SC
A3736A		100-meter FC fiber optic cable M/M multimode SC-SC
C7529A		2-meter FC fiber optic cable M/M duplex LC-SC
C7530A		16-meter FC fiber optic cable M/M duplex LC-SC
C7534A		FC fiber optic coupler F/F SC-SC
C7540A		FC adapter kit (includes C7529A and C7534A)

VA7100 Rail Kits
The following rail kits are needed to mount the VA7100 into the specific racks as listed.

Part Number	Description
A6209A	System/E Rail Kit (RoseBowl 2)
A6496A	NTRittal Rack rail kit
A6244A	HP Original rack rackmount hardware kit

VA7110 Hardware Ordering Information

The following codes define the suffixes on product numbers: A = Field Racked, AE = diskless enclosure (field disk integration), AZ = Factory Racked.

Order drives separately from the Enterprise Module section using the 0D1 option for integration. "AE" products are shipped as diskless enclosure only no integration (disks are ordered separately and field installed).

Product Number	Option Number	Description
VA7110 Field RK SKU		
A7294A		Predefined SKU - VA7110 with Dual Controller, 2 GBICs, 1024-MB Cache (2×512MB DIMM)
A7296A		Predefined SKU - VA7110 with Dual Controller, 2 GBICs, 2048-MB Cache (2×1024MB DIMM)
A7293A	0D1	Field upgrade product. Select Virtual Array Controller (two) and cache (minimum 1024 MB) and disk options separately (factory installed). Includes filler for controllers and disks. (Note that single controller configurations are not supported!)
A6183AE		Empty Enclosure
A7293A	0D1	Virtual Array Controller no memory installed (Note that single controller configurations are not supported!)
A6186A	0D1	1×512MB Cache for Virtual Array Controller, 1×512MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if two are installed). Order 1 per installed VAP
A6187B	0D1	1×1024MB Cache for Virtual Array Controller, 1×1024MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if two are installed). Order 1 per installed VAP
A6192A	0D1	36-GB 10K RPM FC HDD Module
A6193A	0D1	36-GB 15K RPM FC HDD Module
A6194A	0D1	73-GB 10K RPM FC HDD Module
A7288A	0D1	73-GB 15K RPM FC HDD Module
A7289A	0D1	146-GB 10K RPM FC HDD Module
C7524A	0D1	Fiber Optic Cable 2-meter LC 50/125 M/M
C7525A	0D1	Fiber Optic Cable 16-meter LC Duplex 50/125 M/M
C7526A	0D1	Fiber Optic Cable 50-meter LC Duplex 50/125 M/M
C7527A	0D1	Fiber Optic Cable 200-meter LC Duplex 50/125 M/M
C7529A	0D1	2-meter FC fiber optic cable M/M duplex LC-SC
C7530A	0D1	16-meter FC fiber optic cable M/M duplex LC-SC
C7534A	0D1	FC fiber optic coupler F/F SC-SC
C7540A	0D1	FC adapter kit (includes C7529A and C7534A)
VA7110 Factory Rack		
A7294AZ		Predefined SKU - VA7110 with Dual Controller, 2 GBICs, 1024-MB Cache (2×512MB DIMM)
A7296AZ		Predefined SKU - VA7110 with Dual Controller, 2 GBICs, 2048-MB Cache (2×1024MB DIMM)
A6183AZ	0D1	Field upgrade product. Select Virtual Array Controller (one or two) and cache (minimum 1024 MB) and disk options separately (factory installed). Field Installed. Includes enclosure assembly, user manual, and 2 power supplies, filler panels for controllers and disks.
A6186A	0D1	1×512MB Cache for Virtual Array Controller, 1×512MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if two are installed). Order 1 per installed VAP
A6187B	0D1	1×1024MB Cache for Virtual Array Controller, 1×1024MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if two are installed). Order 1 per installed VAP
A6192A	0D1	36-GB 10K RPM FC HDD Module
A6193A	0D1	36-GB 15K RPM FC HDD Module
A6194A	0D1	73-GB 10K RPM FC HDD Module
A7288A	0D1	73-GB 15K RPM FC HDD Module
A7289A	0D1	146-GB 10K RPM FC HDD Module
C7524A	0D1	Fiber Optic Cable 2-meter LC 50/125 M/M

Product Number	Option Number	Description
C7525A	0D1	Fiber Optic Cable 16-meter LC Duplex 50/125 M/M
C7526A	0D1	Fiber Optic Cable 50-meter LC Duplex 50/125 M/M
C7527A	0D1	Fiber Optic Cable 200-meter LC Duplex 50/125 M/M
C7529A	0D1	2-meter FC fiber optic cable M/M duplex LC-SC
C7530A	0D1	16-meter FC fiber optic cable M/M duplex LC-SC
VA7110 Modules		
A7294AE		Predefined SKU - VA7110 with Dual Controller, 2 GBICs, 1024-MB Cache (2×512MB DIMM)
A7296AE		Predefined SKU - VA7110 with Dual Controller, 2 GBICs, 2048-MB Cache (2×1024MB DIMM)
A6183AE		Empty Enclosure
A7293AE		Virtual Array Controller no memory installed (Note that single controller configurations are not supported!)
A6186A		1×512MB Cache for Virtual Array Controller, 1×512MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if two are installed). Order 1 per installed VAP
A6187B		1×1024MB Cache for Virtual Array Controller, 1×1024MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if two are installed). Order 1 per installed VAP
A6192A		36-GB 10K RPM FC HDD Module
A6193A		36-GB 15K RPM FC HDD Module
A6194A		73-GB 10K RPM FC HDD Module
A7288A		73-GB 15K RPM FC HDD Module
A7289A		146-GB 10K RPM FC HDD Module
A6203A		Optical Gigabit Interface Circuit (GBIC)
A3583A		2-meter FC fiber optic cable M/M multimode SC-SC
A3531A		16-meter FC fiber optic cable M/M multimode SC-SC
A3735A		50-meter FC fiber optic cable M/M multimode SC-SC
A3736A		100-meter FC fiber optic cable M/M multimode SC-SC
C7529A		2-meter FC fiber optic cable M/M duplex LC-SC
C7530A		16-meter FC fiber optic cable M/M duplex LC-SC
C7534A		FC fiber optic coupler F/F SC-SC
C7540A		FC adapter kit (includes C7529A and C7534A)

VA7110 Rail Kits

The following rail kits are needed to mount the VA7110 into the specific racks as listed.

Part Number	Description
A6209A	System/E Rail Kit (RoseBowl 2)
A6496A	NTRittal Rack rail kit
A6244A	HP Original rack rackmount hardware kit

VA7410 Controller Enclosure Hardware Ordering Information
The following codes define the suffixes on product numbers: A = Field Racked, AE = Empty enclosure (no integration), AZ = Factory Racked.

Order drives separately from the Enterprise Module section using the 0D1 option for integration. "AE" products are shipped as diskless enclosure only no integration (disks are ordered separately and field installed).

Product Number	Option	Description
VA7410 Enterprise Field RK SKU		
A6267A		VA7410 with Dual Controller 1024-MB Cache Includes: VA Enclosure, (2) 2-Gbps/1-Gbps VA Cont Module Assy, (1) DIMM 1,024-MB, User Guide, Installation Guide, Documentation Map, VA7x00 Documentation CD-ROM, (2) power cord, ESD Kit, RS-232 cable 9-9 pin, HP Command View SDM. Field upgrade product. Select Virtual Array Controller (one or two) and cache and disk options separately (factory installed). Field Installed. Includes enclosure assembly, user manual, and 2 power supplies, filler panels for controllers and disks.
A6268A		VA7410 with Dual Controller 2048-MB Cache Includes: VA Enclosure, (2) 2-Gbps/1-Gbps VA Cont Module Assy, (2) DIMM 1,024-MB, User Guide, Installation Guide, Documentation Map, VA7x00 Documentation CD-ROM, (2) power cord, ESD Kit, RS-232 cable 9-9 pin, HP Command View SDM. Field upgrade product. Select Virtual Array Controller (one or two) and cache and disk options separately (factory installed). Field Installed. Includes enclosure assembly, user manual, and 2 power supplies, filler panels for controllers and disks.
A6187B		1 X 1024-MB Cache for Virtual Array Controller, 1 × 1024-MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6191A	0D1	Enterprise Class 18-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A6192A	0D1	Enterprise Class 36-GB 10K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A6193A	0D1	Enterprise Class 36-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A6194A	0D1	Enterprise Class 73-GB 10K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A7288A	0D1	Enterprise Class 73-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed) (VA7110 and VA7410 only)
A7289A	0D1	Enterprise Class 146-GB 10K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed) (VA7110 and VA7410 only)
C7524A		Fiber Optic Cable 2-meters LC 50/125 M/M
C7525A		Fiber Optic Cable 16-meters LC Duplex 50/125 M/M
C7526A		Fiber Optic Cable 50-meters LC Duplex 50/125 M/M
C7527A		Fiber Optic Cable 200-meters LC Duplex 50/125 M/M
C7529A		2-meter FC fiber optic cable M/M duplex LC-SC
C7530A		16-meter FC fiber optic cable M/M duplex LC-SC
C7534A		FC fiber optic coupler F/F SC-SC
C7540A		FC adapter kit (includes C7529A and C7534A)
VA7410 Enterprise Factory Rack		
A6267AZ		VA7410 with Dual Controller 1024-MB Cache Includes: VA Enclosure, (2) 2-Gbps/1-Gbps VA Cont Module Assy, (1) DIMM 512-MB, User Guide, Installation Guide, Documentation Map, VA7x00 Documentation CD-ROM, (2) power cord, ESD Kit, RS-232 cable 9-9 pin, HP Command View SDM. Field upgrade product. Select Virtual Array Controller (one or two) and cache and disk options separately (factory installed). Field Installed. Includes enclosure assembly, user manual, and 2 power supplies, filler panels for controllers and disks.
A6268AZ		VA7410 with Dual Controller 2048-MB Cache Includes: VA Enclosure, (2) 2-Gbps/1-Gbps VA Cont Module Assy, (2) DIMM 1024-MB, User Guide, Installation Guide, Documentation Map, VA7x00 Documentation CD-ROM, (2) power cord, ESD Kit, RS-232 cable 9-9 pin, HP Command View SDM. Field upgrade product. Select Virtual Array Controller (one or two) and cache and disk options separately (factory installed). Field Installed. Includes enclosure assembly, user manual, and 2 power supplies, filler panels for controllers and disks.
A6187B		1 X 1024-MB Cache for Virtual Array Controller, 1 × 10242MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6191A	0D1	Enterprise Class 18-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A6192A	0D1	Enterprise Class 36-GB 10K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A6193A	0D1	Enterprise Class 36-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A6194A	0D1	Enterprise Class 36-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A7288A	0D1	Enterprise Class 73-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed) (VA7110 and VA7410 only)
A7289A	0D1	Enterprise Class 146-GB 10K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed) (VA7110 and VA7410 only)
C7524A		Fiber Optic Cable 2-meters LC 50/125 M/M

Product Number	Option	Description
C7525A		Fiber Optic Cable 162-meters LC Duplex 50/125 M/M
C7526A		Fiber Optic Cable 502-meters LC Duplex 50/125 M/M
C7527A		Fiber Optic Cable 2002-meters LC Duplex 50/125 M/M
C7529A		2-meter FC fiber optic cable M/M duplex LC-SC
C7530A		16-meter FC fiber optic cable M/M duplex LC-SC
C7534A		FC fiber optic coupler F/F SC-SC
C7540A		FC adapter kit (includes C7529A and C7534A)
VA7410 Enterprise Modules		
A6267AE		VA7410 with Dual Controller 1024-MB Cache Includes: VA Enclosure, (2) 2-Gbps/1-Gbps VA Cont Module Assy, (1) DIMM 512-MB, User Guide, Installation Guide, Documentation Map, VA7x00 Documentation CD-ROM, (2) power cord, ESD Kit, RS-232 cable 9-9 pin, HP Command View SDM. Field upgrade product. Select Virtual Array Controller (one or two) and cache and disk options separately (factory installed). Field Installed. Includes enclosure assembly, user manual, and 2 power supplies, filler panels for controllers and disks.
A6268AE		VA7410 with Dual Controller 2048-MB Cache Includes: VA Enclosure, (2) 2-Gbps/1-Gbps VA Cont Module Assy, (2) DIMM 1024-MB, User Guide, Installation Guide, Documentation Map, VA7x00 Documentation CD-ROM, (2) power cord, ESD Kit, RS-232 cable 9-9 pin, HP Command View SDM. Field upgrade product. Select Virtual Array Controller (one or two) and cache and disk options separately (factory installed). Field Installed. Includes enclosure assembly, user manual, and 2 power supplies, filler panels for controllers and disks.
A6187B		1×1024-MB Cache for Virtual Array Controller, 1×1024 2MB DIMM, StorageWorks VAP requires equal cache for both Controllers (if 2nd installed). Order 1 per installed VAP
A6218A		VA7410 Controller (minimum two required for VA7410)
A6191A		Enterprise Class 18-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A6192A		Enterprise Class 36-GB 10K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A6193A		Enterprise Class 36-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A6194A		Enterprise Class 73-GB 10K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed)
A7288A	0D1	Enterprise Class 73-GB 15K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed) (VA7110 and VA7410 only)
A7289A	0D1	Enterprise Class 146-GB 10K RPM FC HDD (minimum of 10 drives per array - sizes may be mixed) (VA7110 and VA7410 only)
C7524A		Fiber Optic Cable 2-meters LC 50/125 M/M
C7525A		Fiber Optic Cable 16-meters LC Duplex 50/125 M/M
C7526A		Fiber Optic Cable 50-meters LC Duplex 50/125 M/M
C7527A		Fiber Optic Cable 200-meters LC Duplex 50/125 M/M
C7529A		2-meter FC fiber optic cable M/M duplex LC-SC
C7530A		16-meter FC fiber optic cable M/M duplex LC-SC
C7534A		FC fiber optic coupler F/F SC-SC
C7540A		FC adapter kit (includes C7529A and C7534A)

VA7410 Rail Kits

The following rail kits are needed to mount the VA7400 into the specific racks as listed.

Part Number	Description
A6209A	System/E Rail Kit (RoseBowl 2)
A6496A	NTRittal Rack Rail Kit
A6244A	HP Original rack rackmount hardware kit

Disk System Enclosure (DS2405) Hardware Ordering Information

Note: *The DS2405 cannot be used with the VA7100.*

The following codes define the suffixes on product numbers: A = Field Racked, AE = Empty enclosure (no integration), AZ = Factory Racked.

Product Number	Option	Description
DS2405 Disk Enclosure Field Rack		
A6250A		Disk System 2405 field rack enclosure (cables are not included and must be ordered separately)
A6250AE		Disk System 2405 field rack enclosure with no disk integration (cables are not included and must be ordered separately)
A6192A		36-GB 10K RPM Fibre Channel drive add-on
A6192A	0D1	36-GB 10K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15)
A6193A		36-GB 15K RPM Fibre Channel drive add-on
A6193A	0D1	36-GB 15K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15)
A6194A		73-GB 10K RPM Fibre Channel drive add-on
A6194A	0D1	73-GB 10K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15)
A7288A	0D1	73-GB 15K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15)
A7289A	0D1	146-GB 10K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15, 7110 only)
DS2405 Disk Enclosure Factory Rack		
A6250AZ		Disk System 2405 factory rack enclosure (cables are not included and must be ordered separately)
A6191A	0D1	18-GB 15K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15)
A6192A		36-GB 10K RPM Fibre Channel drive add-on
A6192A	0D1	36-GB 10K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15)
A6193A		36-GB 15K RPM Fibre Channel drive add-on
A6193A	0D1	36-GB 15K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15)
A6194A		73-GB 10K RPM Fibre Channel drive add-on
A6194A	0D1	73-GB 10K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15)
A7288A	0D1	73-GB 15K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15)
A7289A	0D1	146-GB 10K RPM Fibre Channel drive installed into the enclosure (must order minimum quantity 2, maximum = 15, 7110 only)
Disk Enclosure Upgrades		
A6209A		System/E Rail Kit
A6496A		NTRittal Rack rail kit
A6244A		HP Original rack rackmount hardware kit

NOTES: A6183A requires rail kits to be ordered separately.
Cache memory for VAP ordering note: You must order one and only one cache memory option type for each array.
Fiber channel disk module ordering note: You must order at least two (2) but not more than fifteen (15) disk modules per enclosure. The unused slots must contain a disk slot filler panel to insure proper cooling of the array. The factory will include filler panels for any remaining open drive bays.

DS2405 Disk System Accessories

C7524A		2-meter Fibre Channel cable LC 50/125 M/M
C7525A		16-meter Fibre Channel cable LC Duplex 50/125 M/M
C7526A		50-meter Fibre Channel cable LC Duplex 50/125 M/M
C7527A		200-meter Fibre Channel cable LC Duplex 50/125 M/M
C7529A		2-meter Fibre Channel cable LC/SC 50/125 M/M
C7530A		16-meter Fibre Channel cable LC/SC 50/125 M/M
C7540A		Fiber optic adapter kit
C7534A		Fiber optic coupler SC F/F
A6209A		System/E rack rail kit
A6244A		HP Original rack rackmount hardware kit
A6496A		NT/Rittal rack rail kit
A6498A		3U 2-post rail kit

VA7000 Family Racking and Rail Kit Options

Note: Solution interconnect cabling/configuration of the A6264A/AZ and A6265A/AZ will be performed by the factory only when specified via Solution Integration Service Plan 2 (A3142B #002) with Visio Drawing attachment. Otherwise, data cables will ship with the solution, unconnected. (Please refer to http://www.sisp.hp.com for information on SISP services.). Not supported under Cronus structure

Note: The VA7100 is not designed to be transported in the RoseBowl 1 or Rittal racks.

HP Rack System/E Products

Part Number	Description	Height	Units
A4900A	HP Rack System/E25	1.25 meters	25U
A4901A	HP Rack System/E33	1.60 meters	33U
A4902A	HP Rack System/E41	1.96 meters	41U

Compaq 9000 Rack Products

Part Number	Description	Height	Units
9122	Rack	1.1 meters	22U
9136	Rack	1.7 meters	36U
9142	Rack	2.0 meters	42U

Support Options Overview

Hardware Support Options

CATS Upfront Support Options for Enterprise; Product Support Packs for Commercial Channel
The following CATS and support pack options are available for the VA7000 Family. The support packs are on the disk system and contain the support pricing for the drives. CATS support, on the other hand, is ordered at the disk level. The following additional rules apply:

Installation and start-up service is required and includes the following on the entire customer order:
- Pre-installation review
- Hardware installation
- Software enablement
- LUN design and implementation
- Customer documentation and orientation

VA Hardware Universal Product Numbers	Description	Direct (Enterprise) CATS and Options [1]		Indirect (Commercial) Support Packs [1]	
		1-, 2-, and 3-year Support: SD, 24×7, SCS, BCS	Installation and Start-Up (H4726A)	3-Year Support: SD, 24×7	Installation and Start-Up
VA7100 Dual Controllers A6261A/AZ/AE; A6262A/AZ/AE, A6263A/AZ/AE	Covers dual processors, cache, enclosure	8AE	5CM	H7555A/E; H7559A/E	H7550A/E
VA7110 Dual Controllers A7294A/AZ/AE; A7295A/AZ/AE; A7296A/AZ/AE	Covers dual processors, cache, enclosure	8AF	5CP	H7561A/E; H7565A/E	H7551A/E
VA7410 Dual Controllers A6267A/AZ/AE; A6268A/AZ/AE	Covers dual processors, cache, enclosure	8AF	5CP	H7561A/E; H7565A/E	H7551A/E
Disk Enclosures A6214A/AZ/AE; A6183A/AZ/AE	Covers enclosure	8AQ	5CA	H7563A/E; H7564A/E	H7558A/E
VA7100 Controller A6188A	Covers processor, cache	803	5CE	H7569A/E; H7570A/E	H7552A/E
VA7110 Controller A7293A	Covers processor, cache	803	5CF	H7567A/E; H7553A/E	H7552A/E
VA7410 Controller A6218A	Covers processor, cache	803	5CF	H7567A/E; H7553A/E	H7552A/E
18-GB HDD A6191A	N/A	8AL	5CG	N/A	N/A
36-GB HDD A6913A, A6192A	N/A	8AN	5CH	N/A	N/A
73-GB HDD A6194A	N/A	8AP	5CJ	N/A	N/A
73-GB HDD A7288A	N/A	8AP	5CJ	N/A	N/A
146-GB HDD A7289A	N/A	8AP	5CJ	N/A	N/A

[1] Direct channel (enterprise customers) purchase support on disks individually; support pack customers ("commercial" or indirect) receive coverage on up to 15 disks with purchase of enclosure or dual controller support packs.

Note: *CATS is the merger of the Camelot and Licensing 2000 projects into one overall program to "reinvent" HP's upfront and contractual support structures. The internal program name is CATS, which stands for Camelot, Aries, Taurus, Scorpio (LS2K releases). For more information on CATS please see the URL at: http://nternet.fc.hp.com/catscore/channels.htm*

HP Service levels	CATS Support Options-1 Year	CATS Support Options-2 Year	CATS Support Options-3 years	CATS Support Options-4 Year	CATS Support Options-5 Year
Same Day	N/A	N/A	N/A	N/A	N/A
24 hours × 7 days	H4404A/H4405A	H4405J	H4404Y/H4405Y	N/A	N/A
Storage Critical Support VA	H4390A	H4390J	H4390Y	H4390G	H4390H
BCS—4 hour Call-to-Restoration	H4395A	N/A	N/A	N/A	N/A

Hardware and Software—Additional Recommended Services

- TAS—H4399A/H4399J/H4399Y
- SAN Implementation Service for SAN environments—H9273A option 380, 381
- Additional Day ASE Time—H9273A option 311
- Service Guard Implementation—H4810AT
- HP StorageWorks Business Copy VA Implementation (Virtual Array)—H9273A option 3B2

Contractual Support for Enterprise and Commercial Channels

Support Suffixes (SPNs)

• 02C	• 07A	• SL2
• 02A	• 07C	• SL3
• 02G	• 07G	
• 02L	• 07V	
• 02V	• 07X	
• 02X		

Description of Services Offered

The 02x are the post warranty support contractual monthly pricing available after the warranty. The 07x are the upgrade warranty support contractual monthly pricing available during the warranty.

Below are the Service Levels:

Code	Description
02A	On-site 4 hour same day hardware response, Monday - Friday, business hours.
07A	07A is available as a warranty upgrade to an 02A response level
02C	On-site next day hardware response, Monday - Friday, business hours (vary by country).
07C	07C available as a warranty upgrade to an 02C response level
02G	On-site 4 hour same day hardware response, seven days a week, 24 hours a day.
07G	07G available as a warranty upgrade to an 02G response level
02L	On-site scheduled hardware response, Monday - Friday, business hours (vary by country).
02V	On-site six-hour hardware call-to-repair, seven days a week, 24 hours a day. Time begins when the original call to the call center is made. Recovery of operating system and other software are excluded from time commitment. Available only for customer sites up to 50 miles (80 km) from a primary HP Support Response Office.
07V	07V available as a warranty upgrade to an 02V repair level
02X	On-site four-hour hardware call-to-restoration, seven days a week, 24 hours a day. Time begins when the original call to the call center is made. Restoration considered complete when an operating system prompt is re-established and the operating system is restored to the customer's last configuration (or when the operating system is restored to a generic configuration for that operating system configuration). Time commitment does not include time needed for recovery of middleware, application software or data. Available only for customer sites up to 50 miles (80 km) from a primary HP Support Response Office. In order to purchase this level of response, the system must be part of a BCS contract.
07X	07X available as a warranty upgrade to an 02X repair level
SL2	8×5 Phone-in assistance (Monday – Friday), 2 hour response, License to Use and updates
SL3	24×7 Phone-in assistance, 2 hour response, License to Use and Updates

Field Replaceable Units (FRUs)

Dual Inline Memory Modules (DIMMs)

Each controller utilizes one or two DIMMs, which contain battery-backed non-volatile RAM (NVRAM). The NVRAM is utilized for read/write caching and to store array memory maps. Because data is spread across all of the disks in the array, the array controller must have a way of determining where each block of data is located. This is accomplished using a logical-to-physical data map stored in NVRAM cache. This data map is vital to managing data; without it, all data in the array is inaccessible. Possible memory configurations are shown.

In a dual controller configuration, both controllers must have the same amount of cache memory as the contents of NVRAM are mirrored between the two controllers. This mirroring process insures that both controllers have exactly the same information in the event of a failure. The controller battery maintains NVRAM contents when normal power is not present. If the battery fails or loses its charge while power is off, the NVRAM contents are lost on that controller. To protect against data loss, the array power/standby switch turns off power to the array and the "Shutdown Operation" copies NVRAM contents to the disk drives in slots 1 and 2 of the array. This allows reconstruction of the data in NVRAM if the original data is lost or corrupted.

Note: When upgrading a VA7400 to a VA7410 or a VA7100 to a VA7110 or a VA7410, both DIMMs need to be the same part number (A6186-60002, for example).

Note: The process of copying the contents of NVRAM to the two recovery disks makes the disk set independent of its controller. Because all the necessary mapping information is on these disks, it is possible to install a new controller or move the entire disk set to another controller. The new controller will determine that it has a new disk set, and the controller will attach itself to those disks.

DIMM Sizes and Cache Sizes

Array	Minimum Cache	Maximum Cache
VA7100	256-MB/controller	1024-MB/controller
VA7110	1024-MB/controller	2048-MB/controller
VA7410	1024-MB / controller	2048-MB / controller

Configurations of only one size DIMM in controllers are supported (for example, mixing 512-MB and 1024-MB DIMMs in the same controller is <u>not</u> supported).

Slot 1 DIMM (MB)	Slot 2 DIMM (MB)	Total Memory (MB)	VA7100	VA7110	VA7410
256-MB	–	256-MB	Y	N	N
256-MB	256-MB	512-MB	Y	N	N
512-MB	–	512-MB	Y	N	N
512-MB	512-MB	1024-MB	Y	Y*	Y*
1024-MB	–	1024-MB	Y	Y	Y
1024-MB	1024-MB	2048-MB	N	Y	Y

* This is a supported configuration, but new VA7110 controllers will not ship with 512-MB DIMMs.

Battery

Each array controller includes one battery to supply backup power to the DIMMs in the event have a power failure or if array power is switched off. If power is lost, the BATTERY LED will flash with a 5% duty cycle while it powers the DIMMs. The battery will maintain a charge for 3.5 days. If the battery loses its charge, or if it is removed from the controller, the DIMMs have no power and NVRAM contents are lost. A battery should be replaced when the software indicates a battery has failed.

Early Warning Switch

In a dual controller configuration, the NVRAM contents on both controllers are updated constantly. By maintaining a mirror image of the NVRAM, the secondary controller can take over immediately if the primary controller fails. If a dual controller needs to be replaced online, an early warning switch incorporated into the latch detects when the controller is being removed. Releasing the latch disables communication between controllers before power is lost to the controller being removed. This prevents corruption of the NVRAM contents.

Disk Drives

The array must have a minimum of four disk drives installed. Several types of disk drives can be installed in the array and capacities can be mixed within the array:

- 18-GB Low-Profile Fibre Channel 15,000 rpm (supported, but no longer orderable)
- 36-GB Low-Profile Fibre Channel 10,000 rpm
- 36-GB Low-Profile Fibre Channel 15,000 rpm
- 73-GB Low-Profile Fibre Channel 10,000 rpm
- 73-GB Low-Profile Fibre Channel 15,000 rpm
- 146-GB Low-Profile Fibre Channel 10,000 rpm (VA7410 and VA7110 arrays only)

The disk drives provide the storage medium for the disk array. A minimum of four disk modules is required to operate the disk array. Different capacity disk modules can be installed in the same array. A new disk can be added at any time, even while the disk array is operating. The array controller will recognize that a new disk has been added and will include the disk in the array configuration automatically if the Auto Include feature is enabled. To make the additional capacity available to the host, a new logical drive must be created, and the resulting drive must be configured into the operating system.

Loading Rules

VA7100
- Four (4) disks minimum and fifteen (15) disks maximum (4 of each type)

VA7110
- Four (4) disks minimum and forty five (45) disks maximum (4 of each type)

VA7410 disk loading rules:
- Ten (10) disk minimum per VA7410
- One hundred and five (105) disks maximum
- Four (4) disks minimum for each disk type that is installed, then user can add singles after that.

DS2405 (disk enclosure) disk loading rules:
- Two (2) disk minimum
- Fifteen (15) disk maximum per DS2405

Estimated Usable Capacity Tables

Estimated Usable Capacity for RAID 1+0—VA7100
This table lists the usable drive capacity, expressed in Gigabytes (GB), of the VA7100 with 36- and 73-GB drives with or without the use of hot spare drives.

Capacity Table 1 GB = $(1024)^3$ for RAID 1+0

Drive size (GB)	36 GB	36 GB	73 GB	73 GB
Hot Spares	2	0	2	0
Number of drives	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB
4	30.0	63.3	63.4	130.2
5	45.2	80.0	95.4	163.6
6	63.3	96.7	130.2	197.1
7	80.0	113.4	163.6	230.5
8	96.7	130.1	197.1	263.9
9	146.8	146.8	297.3	297.3
10	163.4	163.4	330.7	330.7
11	180.1	180.1	364.1	364.1
12	196.8	196.8	397.5	397.5
13	213.5	213.5	431.0	431.0
14	230.2	230.2	464.4	464.4
15	246.9	246.9	497.8	497.8

Capacity Table (GB) 1 GB =1,000,000,000 or $(10)^9$ for RAID 1+0

Drive size (GB)	36 GB	36 GB	73 GB	73 GB
Hot Spares	2	0	2	0
Number of drives	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB
4	32.2	68.0	68.1	139.8
5	48.6	85.9	102.4	175.7
6	68.0	103.8	139.8	211.6
7	85.9	121.8	175.7	247.5
8	103.8	139.7	211.6	283.4
9	157.6	157.6	319.2	319.2
10	175.5	175.5	355.1	355.1
11	193.4	193.4	391.0	391.0
12	211.3	211.3	426.9	426.9
13	229.3	229.3	462.7	462.7
14	247.2	247.2	498.6	498.6
15	265.1	265.1	534.5	534.5

Estimated Usable Capacity for AutoRAID—VA7100

This table lists the usable drive capacity, expressed in Gigabytes (GB), of the VA7100 with 18-, 36-, and 73-GB drives and with or without the use of hot spare drives.

Capacity Table 1 GB = $(1024)^3$ for AutoRAID

Drive size (GB)	36 GB	36 GB	73 GB	73 GB
Hot Spares	2	0	2	0
Number of drives	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB
4	30.0	63.3	63.4	130.3
5	45.2	93.4	95.5	192.6
6	63.3	123.0	130.3	252.7
7	93.4	153.9	192.6	314.4
8	123.0	184.6	252.7	375.9
9	153.9	215.2	314.4	437.3
10	184.6	245.7	375.9	498.4
11	215.2	276.3	437.3	558.9
12	245.7	306.7	498.4	620.6
13	276.3	337.2	558.9	681.7
14	306.7	367.6	620.6	742.6
15	337.2	398.0	681.7	803.5

Capacity Table (GB) 1 GB =1,000,000,000 or $(10)^9$ for AutoRAID

Drive size (GB)	36 GB	36 GB	73 GB	73 GB
Hot Spares	2	0	2	0
Number of drives	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB
4	32.16	68.0	68.1	139.9
5	48.56	100.4	102.5	206.8
6	67.99	132.2	139.9	271.3
7	85.91	165.4	206.8	337.6
8	103.83	198.4	271.3	403.6
9	157.58	231.3	337.6	469.5
10	175.50	264.1	403.6	535.2
11	193.42	296.9	469.5	600.1
12	211.34	329.6	535.2	666.4
13	229.26	362.4	600.1	732.0
14	247.17	395.1	666.4	797.4
15	265.09	427.7	732.0	862.8

Estimated Usable Capacity for RAID 1+0—VA7110

This table lists the usable drive capacity, expressed in Gigabytes (GB), of the VA7110 with 36-, 73-, and 146-GB drives with or without the use of hot spare drives.

Capacity Table 1 GB

Drive size (GB)	36 GB	36 GB	73 GB	73 GB	146 GB	146 GB
Hot Spares	2	0	2	0	2	0
Number of drives	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB
4	29	58	65	130	136	273
8	97	133	205	277	420	563
12	205	205	420	420	850	850
16	277	277	563	563	1137	1137
20	348	348	707	707	1423	1423
24	420	420	850	850	1710	1710
28	492	492	993	993	1997	1997
32	563	563	1137	1137	2284	2284
36	635	635	1280	1280	2570	2570
40	707	707	1423	1423	2857	2857
44	778	778	1567	1567	3144	3144
45	796	796	1603	1603	3215	3215

Estimated Usable Capacity for AutoRAID—VA7110

This table lists the usable drive capacity, expressed in Gigabytes (GB), of the VA7110 with 36-, 73-, and 146-GB drives and with or without the use of hot spare drives.

Capacity Table 1 GB

Drive size (GB)	36 GB	36 GB	73 GB	73 GB	146 GB	146 GB
Hot Spares	2	0	2	0	2	0
Number of drives	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB	Maximum usable capacity in GB
4	29	58	65	130	136	273
8	126	186	265	391	542	800
12	252	317	522	653	1036	1325
16	383	448	784	915	1587	1849
20	514	579	1046	1176	2110	2371
24	644	710	1307	1437	2632	2893
28	775	840	1568	1698	3154	3415
32	905	970	1829	1959	3676	3937
36	1036	1101	2089	2220	4197	4458
40	1166	1231	2350	2481	4719	4980
44	1296	1362	2611	2741	5240	5501
45	1329	1394	2676	2807	5371	5631

GBIC (VA7100 only)

A Gigabit Interface Converter (GBIC) is connected to each array controller as a transceiver for data and to convert the data from an optical signal to an electrical signal and vice versa. Each VAP includes a single GBIC. Based on user configurations, additional GBICs may be required. Only the GBICs A6203A (Enterprise) and A6241A (Commercial) are supported with the VA7100. These are Finisar GBICs, which provide readable serial number functionality.

Redundant Power Supply and Fan Modules

The array is shipped with two fully redundant power/fan modules. Each power/fan module contains:

- One load-sharing power supply which works in conjunction with the second power supply. The power supplies share the power load reciprocally; one supply automatically increases its output to compensate for reduced output from the other. If one power supply fails, the other supply delivers the entire load to maintain power for the array. If both power supplies fail, the controller will shutdown the array. Each power supply uses a separate power cord. Both power supplies can be plugged into a common power source, but it is recommended that each supply be plugged into a separate circuit to provide power source redundancy.
- Two internal fan modules provide cooling airflow and maintain the proper operating temperature for the entire array enclosure. If a fan fails, a fan fault will occur and the associated power supply will shut down. The other power supply will continue to operate and its associated fans will continue to cool the array. Also, if one power supply fails, both of its associated fans will continue to operate to cool the array.

Note: During normal operation, if a failed power supply/fan module is removed, it must be replaced within two minutes to maintain proper cooling of the array. If a power/fan module slot is left empty, the airflow path will be disrupted and the array will overheat.

Midplane

The midplane, internal to the array enclosure, contains the following features for the identification of the array. This information is stored into redundant EEPROMs during the manufacturing process:

Item	Description
World Wide Name (WWN)	The Node WWN is used by the OS drivers to identify the array enclosure.
Default Fibre Channel Loop Addresses	The following default Fibre Channel loop addresses are assigned to array controllers: Array Controller 1: 108 Array Controller 2: 110

The default Fibre Channel loop addresses can be changed using either the Virtual Front Panel (VPF) or the Command Line User Interface (CLUI) included with your HP Command View SDM software.

NOTE: An array in a point-to-point configuration does not arbitrate for the bus, so no Fibre Channel loop addresses are required. |
Product Mode Parameters	Retains various operating parameters
Product Serial Number	Same as the serial number sticker applied to the array
Product ID Number VA7100	Same as the product ID number (A6188A)
Product ID Number VA7110	Same as the product ID number (A7293A)
Product ID Number VA7410	Same the product ID number (A6218A)

User installed licenses are stored within the Midplane EEPROM. These licenses are associated with a particular product serial number. If the Midplane must be replaced, a special Midplane may be ordered which, will allow the automatic regeneration of product serial number, licenses and product mode parameters. This information will be automatically re-programmed within the new Midplane EEPROMs if the replacement procedure is followed.

LED Status Indications

If a disk drive, controller, battery, DIMM, power supply or fan fails in the enclosure, a fault will be indicated by a fault (amber) LED on the module. The nature of the fault can be localized by examining the state of the LEDs.

Array Logs

The array logs consist of the following controller logs:
- Events
  - Errors
  - Unexpected conditions
  - Configuration changes
  - Environmental changes
- Fibre Channel Port Statistics
  - Historical Fibre Channel port information
- Performance
  - Input/Output per second
- Flash
  - Event log stored in flash memory in the event of a loss of battery power

The array logs are stored in two (2) locations:

> The Controller(s).

> Host operating system: The HP Command View SDM software polls the array controller every 15 minutes and updates a host OS directory located on the host server internal disk drive. These logs contain "Event" data will be commonly accessed by the support entity HP Response Center.

Note: The Fibre Channel Port Statistics and Performance log are stored in dynamic memory and will be lost when the array is powered off.

Supported Operating Systems

For Additional Information please see the Disk Storage Information located on the SPOCK web site: (http://hpso.rose.hp.com/spock/index.shtml#Disk_Storage_Information)

- HP-UX
- Windows NT
- Windows 2000
- Windows .NET (when available, VA7110 only)
- Linux
- Solaris—Requires management station
- AIX—Requires management station
- NetWare—Requires management station
- MPE/iX—Requires management station; requires HP SCSI-FC router (A5814A option 003) for Fibre Channel connectivity prior to MPE/iX 7.5; connectivity also supported via Native Fibre Channel in MPE/iX 7.5 or greater.

For the latest configuration information, please refer to the SPOCK website (internal) or the Partnership Website (external):

Spock Website:
- For VA7100 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7100_docs.htm
- For VA7110 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7110_docs.htm
- For VA7410 array: http://nss-streams.corp.hp.com/xp_documentation/va7410_docs.htm

Partnership Website:
- http://partner.americas.hp.com/

Supported Hardware Devices

For the latest configuration information, please refer to the SPOCK website (internal) or the Partnership Website (external):

Spock Website:
- For VA7100 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7100_docs.htm
- For VA7110 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7110_docs.htm
- For VA7410 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7410_docs.htm

Partnership Website:
- http://partner.americas.hp.com/

HBA Support

For the latest configuration information, please refer to the SPOCK website (internal) or the Partnership Website (external):

Spock Website:
- For VA7100 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7100_docs.htm
- For VA7110 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7110_docs.htm
- For VA7410 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7410_docs.htm

Partnership Website:
- http://partner.americas.hp.com/

Hub Support

For the latest AutoPath support and configuration information, please refer to the SPOCK website (internal) or the Partnership Website (external):

Spock Website:
- For VA7100 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7100_docs.htm
- For VA7110 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7110_docs.htm
- For VA7410 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7410_docs.htm

Partnership Website:
- http://partner.americas.hp.com/

Hub	HP-UX 10.20	HP-UX 11.00	HP-UX 11i	NT Advanced Server	NT Enterprise Edition	Windows 2000 Server	Windows 2000 Advanced Server	Linux Red Hat 6.2	AIX 4.3.3 (32- and 64-bit)	Solaris 2.6, 2.7, 2.8	Netware
S10/L10		Yes	Yes	Yes	Yes	Yes	Yes	None		FCI 1063 and FC64-106 3 only	

Switch Support

For the latest AutoPath support and configuration information, please refer to the SPOCK website (internal) or the Partnership Website (external):

Spock Website:
- For VA7100 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7100_docs.htm
- For VA7110 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7110_docs.htm
- For VA7410 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7410_docs.htm

Partnership Website:
- http://partner.americas.hp.com/

Supported Disk Drives

Part Number	Description	All Operating Systems
A6191A	18-GB 15K RPM	Yes
A6192A	36-GB 10K RPM	Yes
A6193A	36-GB 15K RPM	Yes
A6194A	73-GB 10K RPM	Yes
A7288A	73-GB 15K RPM	Yes
A7289A	146-GB 10K RPM (VA7110 and VA7410 only)	Yes

Supported Fibre Channel Cables

Product Number	Description	Usage
Optical LC/LC		
A3583A	Fiber optic cable, SC to SC, M/M, 2-meters (79 in)	VA7100
A3531A	Fiber optic cable, SC to SC, M/M, 16-meters (52 ft)	VA7100
A3735A	Fiber optic cable, SC to SC, M/M, 50-meters (164 ft)	VA7100
A3735A	Fiber optic cable, SC to SC, M/M, 50-meters (164 ft)	VA7100
C7524A	FC Cable 2-meter LC Duplex 50/125 M/M optical	SFF[1] (VA7110, VA7400, VA7410) to SFF FC Infrastructure (2 GB/s FC)
C7525A	FC Cable 16-meter LC 50/125 LC/LC M/M optical	SFF[1] (VA7110, VA7400, VA7410) to SFF FC Infrastructure (2 GB/s FC)
C7526A	FC Cable 50-meter LC Duplex 50/125 M/M optical	SFF[1] (VA7110, VA7400, VA7410) to SFF FC Infrastructure (2 GB/s FC)
C7527A	FC Cable 200-meter LC Duplex 50/125 optical	SFF[1] (VA7110, VA7400, VA7410) to SFF FC Infrastructure (2 GB/s FC)
LC/SC Adapters		
C7529A	FC Cable 2-meter LC/SC Duplex 50/125 M/M optical	SFF[1] (VA7400) to existing 1 GB/s FC Infrastructure
C7530A	FC Cable 16-meter LC/SC Duplex 50/125 LC/LC M/M optical	SFF[1] (VA7400) to existing 1 GB/s FC Infrastructure
C7534A	Fibre Channel SC F/F Extender Optical	Converter for SFF cable to existing large format FC optical cables
C7540A	Fibre Channel Adapter Kit - optical (Includes the C7529A and C7534A)	Kit for existing customer 1 GB/s FC infrastructure

[1] SFF = Small Form Factor

Configuration

Front End and Back End Cabling

Both front-end and back-end cables are Fibre Channel Optical cables.

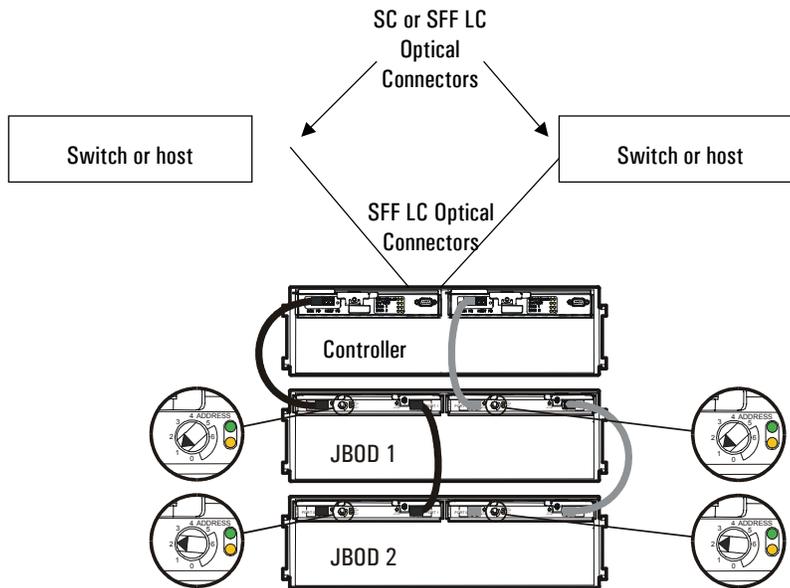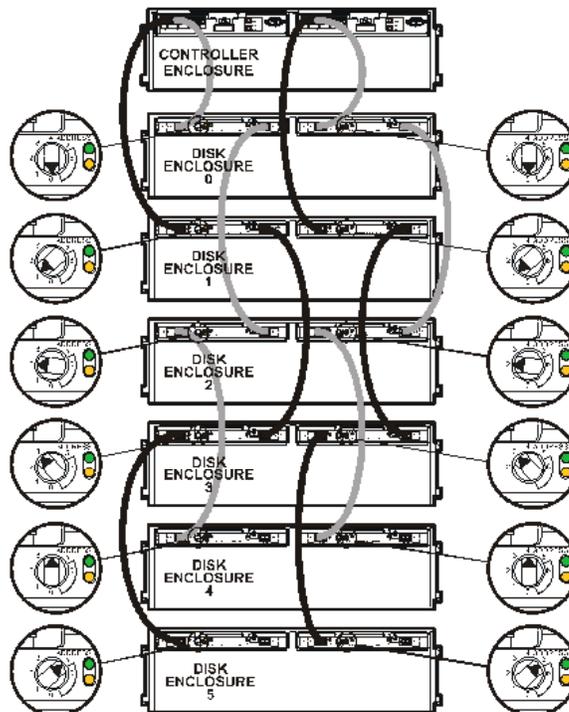**Figure 4.7.10.8 VA7110 Back End Cabling (Serial Connections)**

Figure 4.7.10.9 VA7410 Back End Cabling (Serial Connections)

Long-Distance Configurations (Not supported on MPE/iX)

Long-distance topologies are part of the supported configurations, but may not specifically be represented in this document. Long-distance scenarios may be obtained with the following configurations by replacing host/device connections with any of the combinations of hubs/switches as shown below. Hubs/switches may be cascaded no more than two layers deep and must meet the Fibre-Channel distance criteria (10,000- and 500-meter) for cables.

Figure 4.7.1.10 Long-Distance Substitutions
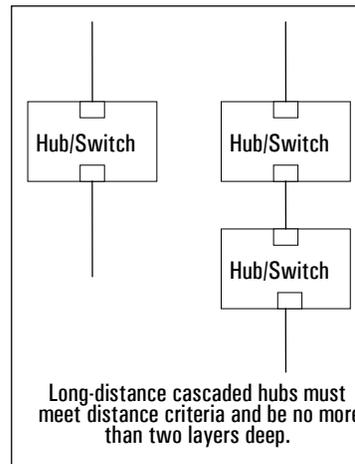
SAN Definitions

Configurations in this document that include a SAN assume the following definition of a SAN or fabric:
A dedicated network of servers and storage devices all connected to a fabric supporting block access technologies. For the purposes of this document, a fabric is defined as a hardware configuration containing at least one switch, which is responsible for frame routing.

Open SAN is defined as heterogeneous (multiple vendor) servers and operating systems, heterogeneous storage, and heterogeneous infrastructure components. Pooled storage access is dependent on a LUN security methodology (zoning, partitioning, or dedicated LUN security) to provide data access by multiple heterogeneous servers. Multiple server access to common data is available only to homogeneous servers using server coordination software (e.g., MC/ServiceGuard for HP-UX and Cluster/iX for MPE/iX). Parallel server access is not supported on MPE/iX.

SAN Characteristics:
- Utilizes a switch-based topology
- Allows cascaded switches
- Supports heterogeneous (multiple vendor) storage
- Switch based
- Heterogeneous server/OS capable
- Heterogeneous (multiple vendor) storage
- Fabric login
- Uses LUN Security or zoning

Note: The SAN does not support common data access for heterogeneous servers.

SAN Manager (management software):
Requires fabric login
- Employs LUN Security or zoning

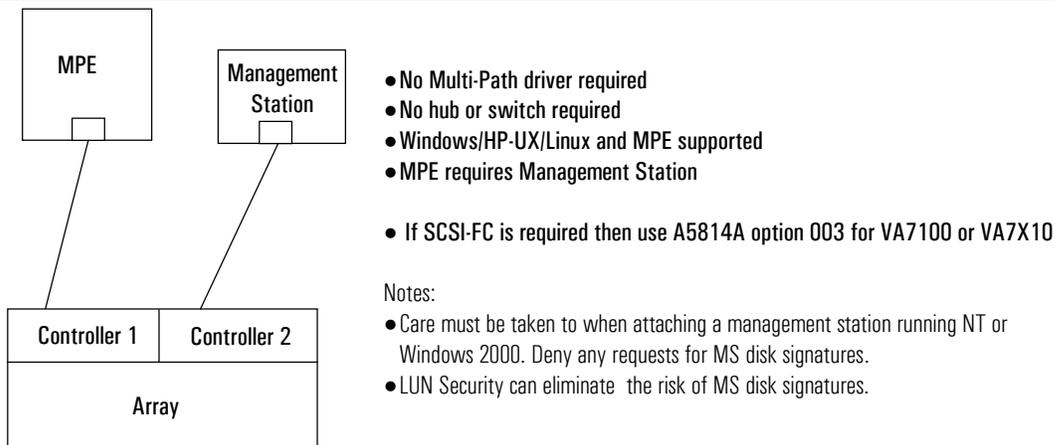**Figure 4.7.1.11 Lowest Entry Point (Minimum Configuration)**

- No Multi-Path driver required
- No hub or switch required
- Windows/HP-UX/Linux and MPE supported
- MPE requires Management Station

- If SCSI-FC is required then use A5814A option 003 for VA7100 or VA7X10

Notes:
- Care must be taken to when attaching a management station running NT or Windows 2000. Deny any requests for MS disk signatures.
- LUN Security can eliminate the risk of MS disk signatures.

Figure 4.7.1.12   Lowest Entry Point, Non-HA—Minimum Configuration (VA7410 only)

- Single HBA per host
- Dual controllers
- Supports Windows 2000, HP-UX/Linux, and MPE
- Requires LUN Security in a heterogeneous environment
- CommandView SDM required on one of the hosts

- If SCSI-FC is required then use A5814A option 003 for VA7410

Up to 4 host optional
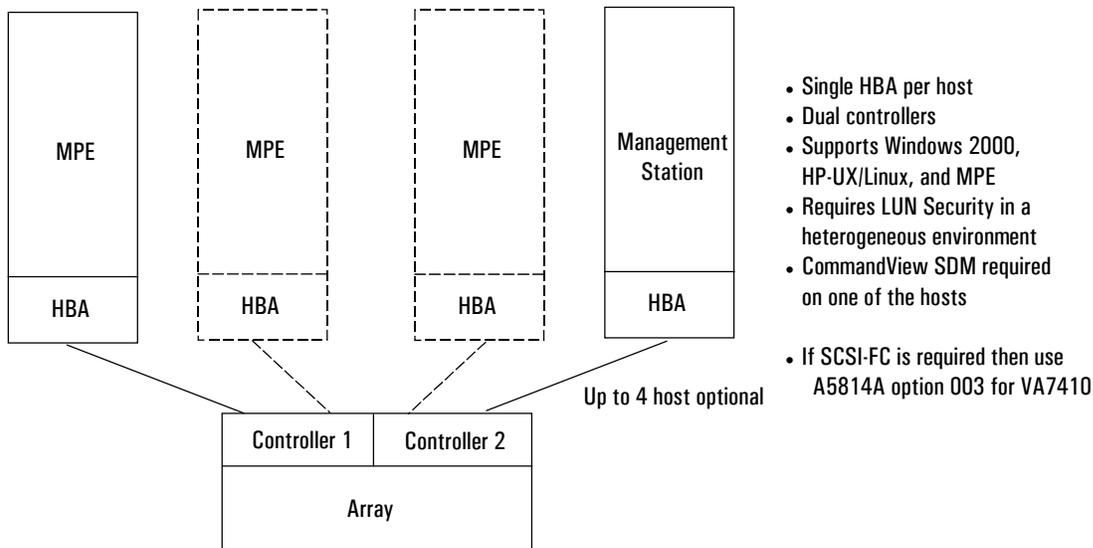
Figure 4.7.1.13   Entry-level Cluster with Path Redundancy—High Availability (VA7410 only)

- LUN Security recommended but not required
- Single HBA
- Two controllers set up with both personalities
- CommandView SDM required on the management station

Notes:
- The VA7410 supports both 1 and 2 Gbps HBAs in the same host **but** the corresponding controller must be set to the same speed as the HBA (if the HBA does not support auto-negotiate). For example, if the HBA is set to 2 Gbps, the connected controller must also be set to 2Gbps.
- This configuration supports MPE's Cluster/iX

Figure 4.7.1.14 Midrange Single-host with Failover/iX (unsupported for VA7100)

```
┌─────────┐  ┌─────────────┐
│   MPE   │  │ Management  │
│         │  │  Station    │
└──┬───┬──┘  └──────┬──────┘
```
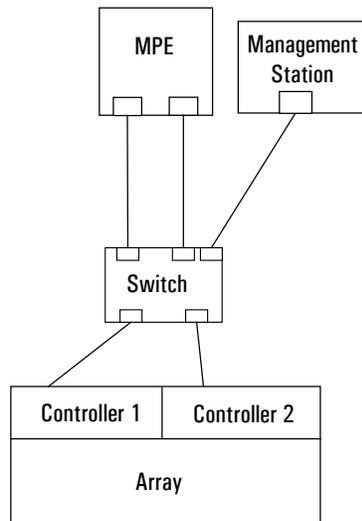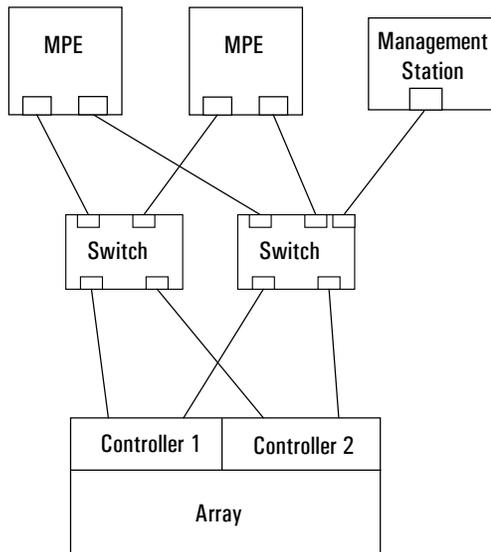
● Dual HBA
● Dual controllers
● Dual switches recommended
● MPE Failover/iX required (unsupported for VA7100)
● Redundancy in storage paths
● Management Station required

```
     ┌─────────┐
     │ Switch  │
     └─────────┘
```

● If SCSI-FC is required then use A5814A option 003 for VA7410

Note:
● If routers are used then use Single Initiator Zoning on the switches

```
┌────────────┬────────────┐
│Controller 1│Controller 2│
├────────────┴────────────┤
│          Array          │
└─────────────────────────┘
```

Figure 4.7.1.15 Midrange Multi-host with Failover/iX (VA7410 only)

```
┌───────┐  ┌───────┐  ┌─────────────┐
│  MPE  │  │  MPE  │  │ Management  │
│       │  │       │  │   Station   │
└───────┘  └───────┘  └─────────────┘
```
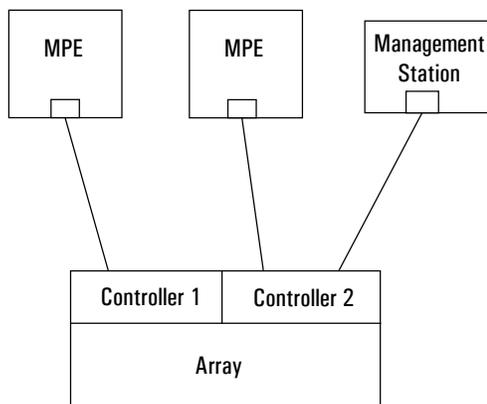
● Dual HBA
● Dual controllers
● Dual switches
● MPE Failover/iX required (unsupported for VA7100)
● Redundancy in storage paths
● Management Station required

```
┌─────────┐  ┌─────────┐
│ Switch  │  │ Switch  │
└─────────┘  └─────────┘
```

● If SCSI-FC is required then use A5814A option 003 for VA7410

Note:
● If routers are used then use Single Initiator Zoning on the switches

```
┌────────────┬────────────┐
│Controller 1│Controller 2│
├────────────┴────────────┤
│          Array          │
└─────────────────────────┘
```

Figure 4.7.1.16 Simple Cluster with no Failover/iX (VA7410 only)

```
┌───────┐  ┌───────┐  ┌─────────────┐
│  MPE  │  │  MPE  │  │ Management  │
│       │  │       │  │   Station   │
└───────┘  └───────┘  └─────────────┘
```

● Single HBA per host
● Dual controllers
● FC Switch
● SCSI-FC Router (A5814A option 003)
● SAN Manager software recommended
● MPE Cluster/iX required
● Management Station required

```
┌────────────┬────────────┐
│Controller 1│Controller 2│
├────────────┴────────────┤
│          Array          │
└─────────────────────────┘
```

SAN Configurations

Figure 4.7.1.17 Midrange Multi-host (Non-clustered) SAN with Optional Path Redundancy

- Dual HBA
- Dual controllers
- Dual switches
- MPE Failover/iX required (unsupported for VA7100)
- Redundancy in storage paths
- Management Station required

- If SCSI-FC is required then use A5814A option 003 for VA7410

Note:
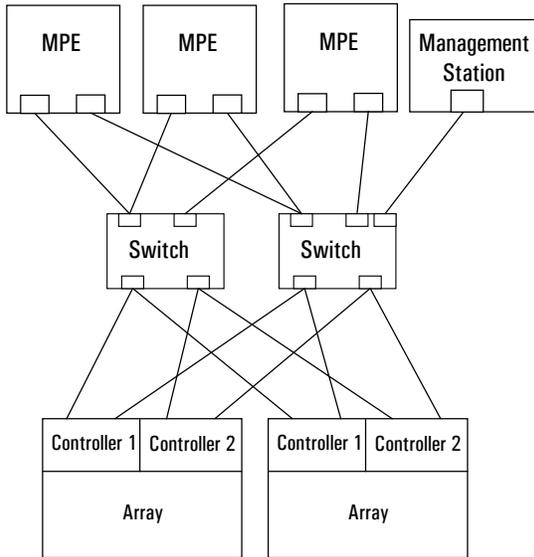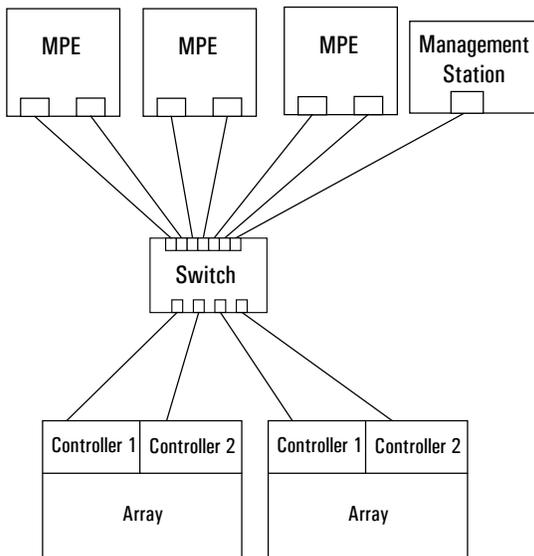- If routers are used then use Single Initiator Zoning on the switches
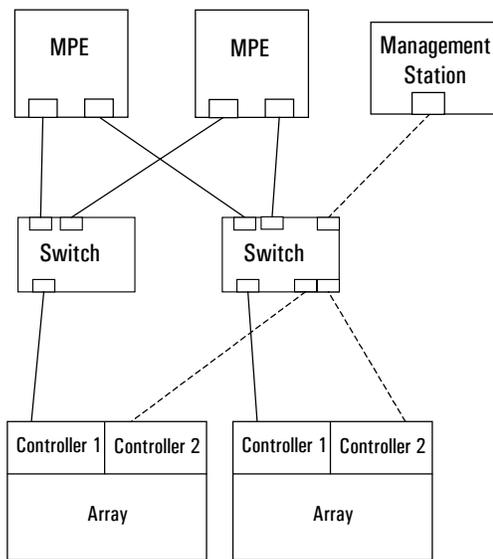
Figure 4.7.1.18 A Typical SAN Configuration

- Dual HBA
- Dual controllers
- Management Station required
- LUN Security is recommended if unfamiliar with managing the management station (disk signatures)

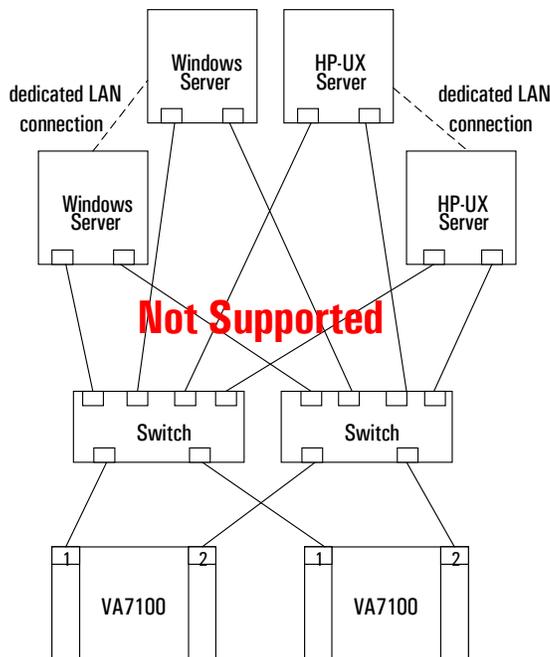- If SCSI-FC is required then use A5814A option 003 for VA7410

Note:
- If routers are used then use Single Initiator Zoning on the switches

Figure 4.7.1.19 MPE/iX SAN Cluster

- Dual HBA
- Dual controllers
- Dual switches
- MPE Cluster/iX required (unsupported on VA7100)
- Management Station required

- If SCSI-FC is required then use A5814A option 003 for VA7410

Note:
- If routers are used then use Single Initiator Zoning on the switches

Figure 4.7.1.20 Heterogeneous Cluster in a SAN

- Requires fabric login
- Requires LUN Security support
- Single or Dual HBA
- Dual controllers
- Requires multi-path driver
- SAN Manager software recommended
- Windows MSCS and MC/ServiceGuard

Figure 4.7.1.21 SAN Consolidation
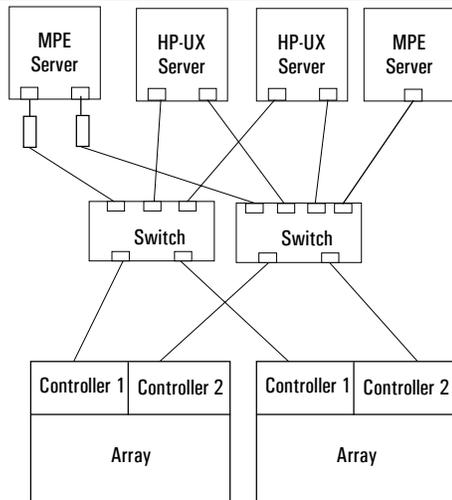
- Requires LUN Security
- Single or Dual HBA
- Controllers setup with appropriate personalities (not supported on VA7100)
- Requires Failover/iX (MPE Not supported on VA7100)
- Requires Management Station

- If SCSI-FC is required then use A5814A option 003 for VA7XXX array

Note:
- If routers are used then use Single Initiator Zoning on the switches

Figure 4.7.1.22 Campus Cluster (Typical)
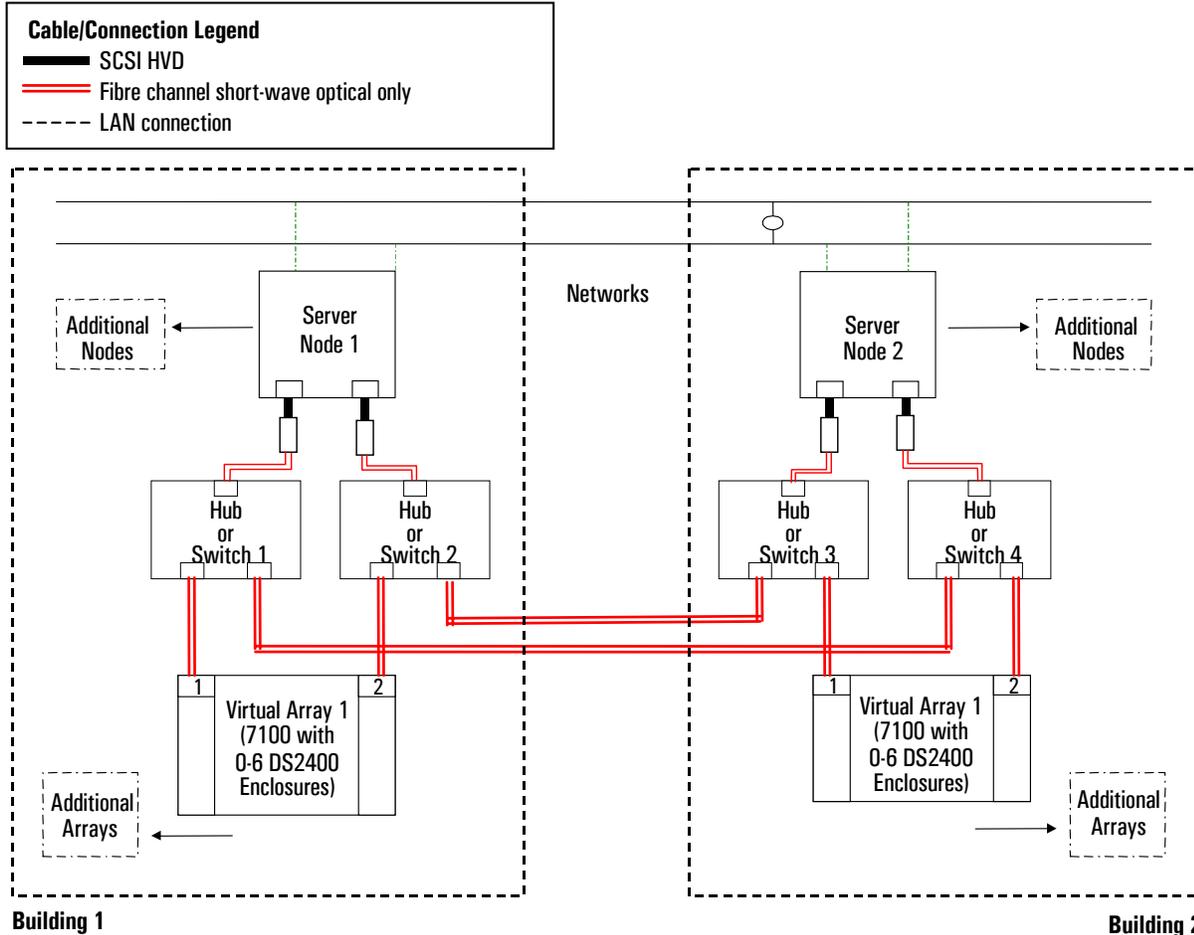
Notes:
- MPE/iX 7.0 Express 1 requires management station and HP SCSI-FC router (A5814A option 003) for Fibre Channel connectivity. Native Fibre Channel supported in MPE/iX 7.5 or greater.
- Hubs and switches cannot be mixed in this configuration. They must be all hubs or all switches.
- Metro Cluster and Continental Cluster are not supported.
- For more details on Campus Cluster, please refer to Campus clusters http://haweb.cup.hp.com/LP/Documents/B7660-90006.pdf

Software Product Descriptions

Software Products Reference Chart

The following table lists the software products available for the VA7000 Family. These products are described in detail later in this section.

Software Product	Source	Description
HP StorageWorks Command View SDM	A single host license-to-use and software media kit ships with each VA7x00 Family product.	Allows you to manage, diagnose, and monitor the performance of the array; used in conjunction with value-added software products. Native OS support on HP-UX, Windows NT, Windows 2000, Red Hat Linux, and with a separate management console on Solaris, Novell Netware, IBM AIX, and MPE. Additional host licenses must be purchased for each host running Command View SDM.
HP StorageWorks Integrations Pack (Formerly Smart Plug-Ins)	Included with Command View SDM.	Enables HP StorageWorks Command View SDM in HP OpenView NNM for HP-UX, Windows 2000 and Windows NT, also enables HP StorageWorks Command View SDM for HP TopTools, CA-Unicenter-TNG, Tivoli Netview and BMC Patrol. Includes/supports HP SEMI 1.0 for HP modular storage and tape devices.
HP StorageWorks Business Copy VA	Sold separately.	Enables LUN copying within the array, and requires the same physical space to be available in the array as the LUN(s) being copied.
HP StorageWorks Secure Manager VA	Sold separately.	Enables LUNs to be locked into a secure shared environment.
HP StorageWorks Auto Path	Sold separately.	Enables I/O path fail-over in a single server for MSCS Windows 2000, Windows NT, HP-UX and Linux environments.
HP StorageWorks Fast Recovery Solutions	Sold separately.	Allows for recovery of corrupted databases in minutes for Microsoft Exchange 2000 or SQL 2000 environments. Requires Business Copy Virtual array

Software Products

Product Number	Description
T1086A	HP StorageWorks Command View SDM 1 host License To Use and software media kit. Device management for the HP StorageWorks VA7x00 Family.
T1003A	HP StorageWorks Secure Manager, 50-GB host License To Use and software media kit. (Required for enablement) (Not combinable - 50 GB max)
T1004A	HP StorageWorks Secure Manager 500-GB License To Use.
T1005A	HP StorageWorks Secure Manager 1-TB License To Use.
T1006A	HP StorageWorks Secure Manager 5-TB License To Use.
T1007A	HP StorageWorks Business Copy VA, 50-GB host License To Use and software media kit. (Required for enablement) (Not combinable - 50 GB max)
T1008A	HP StorageWorks Business Copy VA 500-GB License To Use.
T1009A	HP StorageWorks Business Copy VA 1-TB License To Use.
T1010A	HP StorageWorks Business Copy VA 5-TB License To Use.
T1011A	HP StorageWorks Auto Path for Windows 2000 1-host License To Use and software media kit. (Required for enablement)
T1012A	HP StorageWorks Auto Path for Windows 2000 - 1-host License To Use.
T1013A	HP StorageWorks Auto Path for Windows 2000 - 5-host License To Use.
T1039A	HP StorageWorks Auto Path for Windows NT 4.0 - 1-host License To Use and software media kit. (Required for enablement)
T1040A	HP StorageWorks Auto Path for Windows NT 4.0 - 1-host License To Use.
T1041A	HP StorageWorks Auto Path for Windows NT 4.0 - 5-host License To Use.
T1060A	HP StorageWorks Auto Path for HP-UX 11.0, 11i - 1-host License To Use and software media kit. (Required for enablement)
T1061A	HP StorageWorks Auto Path for HP-UX 11.0, 11i - 1 -host License To Use.
T1062A	HP StorageWorks Auto Path for HP-UX 11.0, 11i - 5-host License To Use.
T1070A	HP StorageWorks Auto Path for Windows Server 2003 - software media kit. (Required for enablement)
T1071A	HP StorageWorks Auto Path for Windows Server 2003 - 1 -host License To Use.
T1072A	HP StorageWorks Auto Path for Windows Server 2003 - 5-host License To Use.
B9550A	HP StorageWorks Fast Recovery Solutions for Microsoft Exchange 2000 1 array based license to use capacity unlimited
B9551A	HP StorageWorks Fast Recovery Solutions for Microsoft SQL 2000 1 array based license to use capacity unlimited

HP StorageWorks Command View SDM Software

The HP StorageWorks Command View SDM software is a host or Web-browser based device management application that provides a common user interface for modular networked storage systems.

The HP StorageWorks Command View SDM software monitors and manages modular scaleable storage resources from a single systems management console or remotely via a Web browser with centralized control of their information resources. The HP StorageWorks Command View SDM software launches and configures HP value added software, such as HP StorageWorks Business Copy VA and HP StorageWorks Secure Manager VA. The HP StorageWorks Command View SDM software supports the HP StorageWorks VA 7000 family.

- Integrated device management platform and common user interface for all supported HP modular scaleable storage (arrays and disk systems)
- Java technology for ease of portability for support of new storage devices
- Active Graphic displays and status at glance features provides a comprehensive environment to monitor health and status with the highest efficiency and awareness.
- Common user interface (GUI, CLUI, CVUI and Web browser support) reduces training needs
- Network management and SANs integration for SAN network connectivity and device identification and event reporting to industry leading network management applications such as HP OpenView.
- Heterogeneous support

HP StorageWorks Command View SDM Operating Systems Compatibility

For operating system compatibility, please see "Supported Operating Systems" on page 4-117.

HP StorageWorks Command View SDM Software Compatibility
- HP StorageWorks Command View SDM
- HP StorageWorks Integrations Pack
- HP StorageWorks Secure Manager
- HP StorageWorks Business Copy VA

HP StorageWorks Command View SDM Minimum System Requirements
- Requires Internet Explorer 5.0; Netscape 4.74; Java Plug-In 1.3
- Need to add installation requirements for RAM

Operating System	CPU	Memory	Video	Disk Space[2]
Windows NT 4.0 (SP 6a) Windows 2000 (SP 1) Windows Server 2003 (32-bit)	Pentium III 500 MHz	256 MB RAM	1024×768 resolution, supports 64,000 colors	120 MB of free disk space Performance Logs (2 months) 16 MB per LUN
HP-UX 11.0/11.11, 11.23[3]	All	256 MB RAM	800×600 resolution, supports 64,000 colors	120 MB of free disk space Performance Logs (2 months) 16 MB per LUN
Red Hat Linux 7.1, AS2.1	Pentium III 500 MHz	256 MB RAM	1024×768 resolution, supports 64,000 colors	120 MB of free disk space Performance Logs (2 months) 16 MB per LUN
MPE/iX [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
Solaris [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
Novell Netware [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
IBM AIX [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).

[1] Requires dedicated management console and system requirements compatible with one of the above.
[2] 30 MB of temporary disk space is required during installation. This space is returned after installation.
[3] HP-UX may require additional patches for proper operation.

The VA7x00 family system encompasses all the components within the controller chassis as well as the disks and their enclosures. The VA7x00 family Graphical User Interface (GUI) provides capabilities to retrieve single or multiple component status conditions and modify component states when applicable. The table lists all the components visible to the user. The first column denotes components that have their status queried and displayed by the GUI. The second column denotes components that the user can modify via the GUI.

Note: This is the Command Line User Interface (CLUI) that is used for the VA7000 Family.

Component Device Offerings

Component	GUI provides capabilities to Query State	GUI provides capabilities to Modify State
Main Enclosure	●	●
Batteries	●	
Controllers	●	●[3]
DIMMs	●	
Disks	●	●
Fans	●	
GBICs	●	
Power Supplies	●	
Ports	●	
JBODS	●	●
Disks	●	●
Fans	●	
LCC	●	
Power Supplies	●	

[3] This does not reflect changing state of the controller, but rather modifying controller parameters.

HP StorageWorks Command View SDM Frequently Asked Questions

What is included with the standalone version of HP StorageWorks Command View SDM?
Each Standalone version of HP StorageWorks Command View SDM includes:
- Software CD
- User's Manual
- One Host License To Use

This is defined as "Installation Authorization for one (1) Server" running any or all of the Command View SDM components listed above.

Support is NOT INCLUDED with the Standalone version of HP StorageWorks Command View SDM. One (1) support option is required with each one (1) Host LTU of HP StorageWorks Command View SDM.

Do I need HP StorageWorks Command View SDM installed on all hosts in a configuration order to access my VA?
You must install HP StorageWorks Command View SDM on at least one (1) host with a fibre channel connection to the VA7100, VA7110 or VA7410. After your initial installation of HP StorageWorks Command View SDM, it is not necessary to install HP StorageWorks Command View SDM to access data on your VA.

Is HP StorageWorks Command View SDM only required for management/configuration purposes?
HP StorageWorks Command View SDM is only required for configuration and management of your HP VA. After your initial installation of HP StorageWorks Command View SDM, it is not necessary to install HP StorageWorks Command View SDM to access data on your VA.

How many VA's can HP StorageWorks Command View SDM manage at any given time?
HP StorageWorks Command View SDM can manage an unlimited number of VA from a single host, provided that it is physically connected to each VA either directly or through a SAN

HP StorageWorks Integrations Pack

HP StorageWorks Integrations Pack provide customers with a basic level of integration between HP StorageWorks Command View SDM and the leading network and systems management solutions enabling management from a single point—the enterprise management console. Integration is via SNMP (Simple Network Management Protocol) and enables customers to observe, diagnose and react to potential problems in their storage environment before they become serious enough to affect system availability.

HP StorageWorks Integrations Pack Features
- Integration with HP OpenView NNM, HP ToPTools, CA Unicenter-TNG, Tivoli Netview, and BMC Patrol
- Includes/supports HP SEMI 1.0 agent for HP modular storage and tape devices
- Plug and play installation
- Automated custom scripts
- Automatic discovery of supported storage devices by the network management application
- Device event communication via SNMP for Windows 2000 and NT 4.0 environments
- Changes in the status of the device are represented via the device icon that can launch the device software for further diagnostics or configuration status.

Notes:
HP StorageWorks Integrations Pack:
- *are only supported on HP StorageWorks Command View SDM for modular networked storage. They are not supported on XP arrays*
- *do not support Red Hat Linux 6.2, 7.1.*

HP StorageWorks Integrations Pack Compatibility
- Supports HP SNMP integration for HP virtual arrays
- Supports HP OpenView Network Node Manager for HP-UX, Windows NT 4.0, and Windows 2000.
- Supports HP ToPTools 4.5 and 5.0
- Supports CA Unicenter TNG for HP-UX, NT 4.0, and Windows 2000
- Supports HP StorageWorks VA7x00 Family
- Supports Tivoli Netview
- Supports BMC Patrol
- Supports HP SEMI 1.0 agent for HP modular storage and tape devices

HP StorageWorks Integrations Pack Frequently Asked Questions

What is included with HP StorageWorks Integrations Pack?
Each HP StorageWorks Integrations Pack product includes:
- Software CD
- User's Manual
- One Host License To Use (LTU)

This is defined as "Installation Authorization for one (1) Server" running any or all of HP StorageWorks Integrations Pack components.

Support is not included with this product. One (1) support option is required with each one (1) Host LTU for Enterprise Integrations.

How does HP StorageWorks Command View SDM talk to OpenView Network Node-Manager using the HP StorageWorks Integrations Pack?
HP StorageWorks Command View SDM tracks each connected VA7000 family array using a unique TCP-IP address. HP StorageWorks Command View SDM gets device information from each virtual array inband through the fibre channel connection and the HP StorageWorks Integrations Pack translate this information to OpenView Network Node Manager over TCP-IP using JVM and standard SNMP commands.

HP StorageWorks Business Copy VA

HP StorageWorks Business Copy VA is an array-based software product that allows customers to create up to 1023 non-disruptive high-performance, local business copies of any active application volume or LUN for the VA7000 family array within the array while benefiting from full RAID protection for the business copies. These LUN copies can be used by another application or system for a variety of purposes, including batch processing and backup. You can create up to 1023 Business Copy LUNs with the VA7000 family arrays. Business Copy VA is fully integrated into and enabled through the HP Command View SDM software interface.

HP StorageWorks Business Copy VA is a vital piece of the Virtual Array Technology and is the key enabler of the virtual array online Backup solution, which is implemented using custom scripting of backup application environments.

HP StorageWorks Business Copy VA Features
- Business critical data can be executed in parallel to enhance efficiency and cost effectiveness.
- Instantly creating point-in-time copies of source LUNs, scheduling backup activities, and maintaining I/O Host performance because all LUN creation and activity is handled directly by the array.
- HP StorageWorks Business Copy VA is fully integrated with Command View SDM.

HP StorageWorks Business Copy VA Operating Systems Compatibility
HP StorageWorks Business Copy VA runs with HP StorageWorks Command View SDM. For operating system compatibility, please see "Supported Operating Systems" on page 4-117.

HP StorageWorks Business Copy VA Software Compatibility
- HP StorageWorks Command View SDM
- HP StorageWorks Integrations Pack
- HP StorageWorks Secure Manager
- HP StorageWorks Business Copy VA

HP StorageWorks Business Copy VA Minimum System Requirements

Operating System	CPU	Memory	Disk Space
Windows NT 4.0 Windows 2000 Windows Server 2003 (32 bit)	Pentium III 500-MHz	256 MB RAM	45 MB of free disk space.
HP-UX 11.0, 11.11, 11.23	All	256 MB RAM	60 MB of free disk space.
Red Hat Linux 7.1, AS2.1	Pentium III 500-MHz	256 MB RAM	45 MB of free disk space
HP-UX 10.20 [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
MPE/iX [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
Solaris [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
Novell Netware [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
IBM AIX [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).

[1] Requires dedicated management console and system requirements compatible with one of the above.

Note: *HP StorageWorks Business Copy VA supports a custom scripted implementation to automate backup solutions.*

HP StorageWorks Business Copy VA Frequently Asked Questions

What is included with HP StorageWorks Business Copy VA Software Media Kit?
Each HP StorageWorks Business Copy VA software media kit includes:
- Software CD
- User's Manual
- 50-GB License To Use (not combinable - 50 GB max)
- 90 days of telephone support

In addition, to cover all capacity-based license-to-use options for HP StorageWorks Business Copy VA, one (1) support option is required.

How does HP StorageWorks Business Copy VA Licensing work?
In order to create HP StorageWorks Business Copy VA LUNs, a license must be obtained. Licensing is sold in quantities of 500 GB, 1 TB and 5 TB. The total size for all HP StorageWorks Business Copy VA LUNs cannot exceed the licensed amount for each virtual array.

HP StorageWorks Business Copy VA licensing is based on the total size of all parent LUNs being copied, not the total array capacity. For example, in an array with total usable capacity of two (2) Terabytes, if you are copying one (1) Terabyte of parent LUN data you must purchase a one (1) Terabyte HP StorageWorks Business Copy VA license.

Note: Licenses cannot span multiple arrays!

Every VA7000 series array contains a 50-GB trial license. This is a permanent capability of the array and is intended to allow the trial of the feature before committing to the purchase. The trial copy can be used for the life of the product. ***This trial license is NOT additive***.

IS HP StorageWorks Business Copy VA supported for MPE/iX
No. There are no plans to support HP StorageWorks Business Copy VA on MEP/iX.

HP StorageWorks Secure Manager VA

HP StorageWorks Secure Manager VA is an array-based software product that allows customers to create up to 128 secure World Wide Name connections for the VA7000 family array on up to 1024 secure LUNs per virtual array. HP StorageWorks Secure Manager VA is fully integrated into and enabled through the HP Command View SDM software interface.

HP StorageWorks Secure Manager VA is a storage software application that allows LUNs to be locked into secure protected volumes by World Wide Names, ensuring that only authorized World Wide Names (WWN) have access to restricted volumes. Permissions for each principal can be configured by volume within the virtual array to read only, read/write, or no access. The HP StorageWorks Secure Manager VA software's supported configurations range from an entry-level single-server direct-connect environment up to a homogeneous or heterogeneous clustered environment.

HP StorageWorks Secure Manager VA Features
- World Wide Names, host, and volume to enhance efficiency and cost effectiveness can secure business critical data in parallel.
- Configure security within the virtual array by changing permissions on volumes and/or World Wide Names (WWN) while the array is online.
- Uses the HP StorageWorks Command View SDM interface for establishing secure volumes.
- HP StorageWorks Secure Manager VA is fully integrated with HP StorageWorks Command View SDM and the VA family of hardware and software products for interoperability across the spectrum of future virtual array storage solutions.
- HP StorageWorks Secure Manager VA supports 128 secure World Wide Names for the VA7400. The HP StorageWorks Secure Manager VA software supports up to 1024 secure LUNs for each VA7000 family array.

HP StorageWorks Secure Manager VA Operating Systems Compatibility
HP StorageWorks Secure Manager VA runs with HP StorageWorks Command View SDM. For operating system compatibility, please see "Supported Operating Systems" on page 4-117.

HP StorageWorks Secure Manager VA Software Compatibility
- HP StorageWorks Command View SDM
- HP StorageWorks Integrations Pack
- HP StorageWorks Secure Manager
- HP StorageWorks Business Copy VA

HP StorageWorks Secure Manager VA Minimum System Requirements

Operating System	CPU	Memory	Disk Space
Windows NT 4.0 and Windows 2000	Pentium III 500-MHz	256 MB RAM	45 MB of free disk space.
HP-UX 11.0, 11.1	All	256 MB RAM	60 MB of free disk space.
Red Hat Linux 6.2	Pentium III 500-MHz	256 MB RAM	45 MB of free disk space
HP-UX 10.20	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
Solaris 2.6, 7.0, 8.0 [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
Novell Netware 5.0,5.1 [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).
IBM AIX 4.3.3 [1]	Depends on management station (see above).	Depends on management station (see above).	Depends on management station (see above).

[1] Requires dedicated management console and system requirements compatible with one of the above.

HP StorageWorks Secure Manager VA Frequently Asked Questions

What is included with HP StorageWorks Secure Manager VA Software Media Kit?
Each HP StorageWorks Secure Manager VA software media kit includes:
- Software CD.
- User's Manual.
- 50-GB License To Use (LTU).
- 90 days of telephone support.
- In addition, one support option is required for each capacity-based license-to-use option for HP StorageWorks Secure Manager VA.

What does the term "principal" mean when used in HP StorageWorks Secure Manager VA?
"Principal" and "World Wide Name" (WWN) are used interchangeably when describing secure connections for HP Virtual Arrays. All authentications for the VA7400 are based on WWN.

How many secure connections can each VA7000 family array support?
The VA7000 family array can support up to 128 secure Node WWN. Each Host Bus Adapter (HBA) uses a single Node WWN, therefore each VA7000 family array can support up to 1024 secure connections. Remember, for HA configurations, each server requires two HBAs so the largest HA configuration supported for each VA7000 family array is a 16-node cluster.

Can incremental capacity licenses be added over time?
Yes, licenses are cumulative and additional licenses to may be added as capacity needs grow.

HP StorageWorks Auto Path

HP StorageWorks Auto Path VA is host-based software that provides key data availability and performance. HP StorageWorks Auto Path provides multi-path failover capability of all I/O data paths to the virtual array. HP StorageWorks Auto Path offers completely automatic HBA failover for all supported cluster environments.

Note: If a customer has met or is near the VA performance threshold, it is possible that high I/O demand (at 90% or greater of the VA threshold) may cause a performance degradation when running in a load-balancing configuration. Load balancing is not recommended for VA configurations that consistently require over 90% of the overall VA performance bandwidth!

For the latest configuration information, please refer to the SPOCK website (internal) or the Partnership Website (external):

Spock Website:
- For VA7100 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7100_docs.htm
- For VA7110 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7110_docs.htm
- For VA7410 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7410_docs.htm

Partnership Website:
- http://partner.americas.hp.com/

HP StorageWorks Auto Path Features
- Automatic error detection and failover: helps eliminate the need for planned and unplanned downtime.
- Works with Windows 2000 and Microsoft Cluster Server infrastructure.
- Works with Windows NT 4.0 and Microsoft Cluster Server infrastructure
- Works with HP-UX 11.0, 11i and MC/ServiceGuard infrastructure
- Supports the HP VA products that provide maximum performance and scalability.
- Automated configuration
- Management through a graphical user interface

HP StorageWorks Auto Path Operating Systems Compatibility
Please see "Supported Operating Systems" on page 4-117.

HP StorageWorks Auto Path Software Compatibility
- HP StorageWorks Command View SDM
- HP StorageWorks Integrations Pack
- HP StorageWorks Secure Manager
- HP StorageWorks Business Copy VA

HP StorageWorks Auto Path Minimum System Requirements

Operating System	CPU	Memory	Disk Space
Windows 2000, NT 4.0	Pentium III- 500 MHZ	256 MB RAM	45 MB of free disk space.
HP-UX 11.0, 11i	All	256 MB RAM	45 MB of free disk space.

Note: HP StorageWorks Auto Path provides automatic I/O path failover only for Windows 2000, NT 4.0, and HP-UX 11.0, 11i.

All HP software products are covered by a 90-day media defect warranty. All support options are sold separately.

HP StorageWorks Auto Path Frequently Asked Questions

What is included with HP StorageWorks Auto Path?
Each HP StorageWorks Auto Path product includes:
- Software CD
- User's Manual
- One (1) Host License To Use (LTU)

This is defined as "Installation Authorization for one (1) Server" running any or all Auto Path components.

Support is NOT included with this product. One (1) support option is required for each host-based license-to-use option for HP StorageWorks Auto Path.

What environments are available for HP StorageWorks Auto Path on the VA?
HP StorageWorks Auto Path has planned availability of Windows 2000, Windows NT, and HP-UX with Red Hat Linux planned for future availability.

HP StorageWorks Fast Recovery Solutions for Microsoft Exchange 2000 & SQL 2000

HP StorageWorks Fast Recovery Solutions (FRS) is a tool designed to enable fast recovery of corrupt Exchange 2000 or SQL 2000 databases. FRS interacts with Windows 2000, Exchange 2000 or SQL server, and the disk array. The disk array stages recovery ready copies of Exchange 2000/SQL 2000 databases. When a catastrophic event occurs, the Exchange administrator initiates the FRS process. This process takes the damaged database offline, removes it and inserts the known good, recovery-ready copy on the production server. This process recovers the known good copy from disk rather than tape providing a full database recovery in minutes not hours.

For the latest configuration information, please refer to the SPOCK website (internal) or the Partnership Website (external):

Spock Website:
- For VA7100 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7100_docs.htm
- For VA7110 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7110_docs.htm
- For VA7400 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7400_docs.htm
- For VA7410 array: http://xpslpgrms.corp.hp.com/xp_documentation/va7410_docs.htm

Partnership Website:
- http://partner.americas.hp.com/

HP StorageWorks Fast Recovery Solutions Features
- Ultra-fast recovery of large Microsoft Exchange 2000 or SQL 2000 databases.
- Lowest possible downtime during a corruption and database recovery.
- Recovery to the last backup.
- Multiple databases can be recovered simultaneously.

VA7000 Family Software Ordering Information

HP StorageWorks VA Software Support Products

Product Number	Option	Description
T1086A		HP StorageWorks Command View SDM Software Media Kit with - 1 Host License To Use
		One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1002A		HP StorageWorks Integrations Pack for HP StorageWorks Command View SDM
		One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
		HP StorageWorks Secure Manager VA Software Media Kit and 50 GB License To Use (required for enablement)
		90-day support included (Not combinable - 50 GB max)
	H4403A/H4405A	N/A
	H4403J/H4405J	Two (2) year software support
	H4403Y/H4405Y	N/A
	H4726A	N/A
T1004A		HP StorageWorks Secure Manager VA 500 GB License To Use
		One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support

Product Number	Option	Description
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1005A		HP StorageWorks Secure Manager VA - 1TB License To Use-One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1006A		HP StorageWorks Secure Manager VA - 5 TB License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1007A		HP StorageWorks Business Copy VA Software Media Kit and 50 GB License To Use (required for enablement) 90-day support included (Not combinable - 50 GB max)
	H4403A/H4405A	N/A
	H4403J/H4405J	Two (2) year software support
	H4403Y/H4405Y	N/A
	H4726A	N/A
T1008A		HP StorageWorks Business Copy VA 500 GB License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1009A		HP StorageWorks Business Copy VA - 1 TB License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1010A		HP StorageWorks Business Copy VA - 5 TB License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1011A		HP StorageWorks Auto Path for Windows 2000 Software Media Kit and 1 Host License To Use (required for enablement) One software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1012A		HP StorageWorks Auto Path for Windows 2000 - 1 Host License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1013A		HP StorageWorks Auto Path for Windows 2000 - 5 Host License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support

Product Number	Option	Description
	H4726A	Software enablement, installation and customer demonstration service
T1039A		HP StorageWorks Auto Path for Windows NT 4.0 Software Media Kit and 1 Host License To Use (required for enablement) One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1040A		HP StorageWorks Auto Path for Windows NT 4.0 - 1 Host License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1041A		HP StorageWorks Auto Path for Windows NT 4.0 - 5 Host License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405J	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1042A		HP StorageWorks Auto Path for Windows NT 4.0 - 10 Host License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1043A		HP StorageWorks Auto Path for Windows NT 4.0 - 25 Host License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1060A		HP StorageWorks Auto Path for HP-UX 11.0,11i Software Media Kit and 1 Host License To Use (required for enablement) One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1061A		HP StorageWorks Auto Path for HP-UX 11.0,11i 1 Host License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1062A		HP StorageWorks Auto Path for HP-UX 11.0,11i - 5 Host License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1070A		HP StorageWorks Auto Path for Windows Server 2003 Software Media Kit (required for enablement) One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1071A		HP StorageWorks Auto Path for Windows Server 2003 1 Host License To Use One (1) software support

Product Number	Option	Description
		warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
T1072A		HP StorageWorks Auto Path for Windows Server 2003 - 5 Host License To Use One (1) software support warranty option required
	H4403A/H4405A	One (1) year software support
	H4403J/H4405J	Two (2) year software support
	H4405Y	Three (3) year software support
	H4726A	Software enablement, installation and customer demonstration service
B9550A		HP StorageWorks Fast Recovery Solutions for Microsoft Exchange 2000 1 Array-based License to Use, capacity unlimited
	H4403A/H4405A	One (1) year software support
	H4405Y	Three (3) year software support
B9551A		HP StorageWorks Fast Recovery Solutions for Microsoft SQL 2000 1 Array-based License to Use, capacity unlimited
	H4403A/H4405A	One (1) year software support
	H4405Y	Three (3) year software support

HP e3000 Business Servers Configuration Guide – Effective 1/04
Information Subject to Change

Glossary

Abbreviation	Description
Bps	Bits per second
BE	Back End
CLUI	Command Line User Interface
Cluster	For the purposes of this document, a cluster is a configuration using two or more servers with failover capability. For HP-UX based configurations, this means running ServiceGuard. Windows-based cluster configurations incorporate the following characteristics: ·Windows Enterprise Edition for NT 4.0; Windows Advanced Server; Data Center Server for Windows 2000 (currently not released and not defined-this is an issue)
Cluster-Aware	Application is aware of cluster environment, informs the user a cluster exists, and provides additional cluster information
Cluster-Safe	Application does not prevent a MSCS cluster certification and does not create loss of data in a MSCS cluster environment
Cluster-Supported	Application is a transferable resource in a cluster; i.e., if a node in a cluster is taken off-line, the application will failover automatically to another cluster node.
Data Center	Version of Windows 2000 OS that allows clustering of up to four servers.
DR	Design Release
ESI	Enhanced Serial Interface
ESN	Enterprise Storage Network
Fabric Login	The name given to the initialization protocol for a device on the Storage Area Network (SAN) fabric with which it is "logged" into the SAN fabric. The act of "logging" provides the fabric with the required information about the device so that the device can be accessed and allows the device to access any other "fabric" device on the fabric.
FE	Front End
Fsam	Federated Storage Area Management
GB	Gigabyte(s)
GBIC	Gigabyte Interface Connector; plugged into the VA7100 controller to provide the optical interface to the host.
Gbit	Gigabit(s) (Note: HP standard says do not abbreviate as Gb.)
GB/s	Gigabits per second
GHz	Gigahertz
GLM	Gigabyte Link Module; generally associated with the HBA and the optical connection.
GUI	Graphical User Interface
HBA	Host Bus Adapter
HCL	Hardware Compatibility List
Heterogeneous	Dissimilar, differing in structure and quality
JBOD	Storage/RAID Device (just a bunch of disks)
I/O	Input/Output
k	Kilo (prefix meaning 1,024)
K	Kilo (prefix meaning 1,024)
Kbit	Kilobit (1,024 bits) (Note: HP standard says do not abbreviate as Kb.)
KB	Kilobyte (1,024 bytes)
Kbps	Kilobytes per second
LUN	Logical Unit Number (virtual disk)
Mbit	Megabit
Mb/s	Megabits per second
MB	Megabyte(s)
MB/s	Megabytes per second
Windows MSCS	Windows software that coordinates two servers and directs the other server to take over when one fails.
Multi-path aware	Ability to have knowledge of multiple paths to the storage device.
Multi-path driver	Device driver that masks multiple access paths to a physical device. Ability to switch between paths.
RAID	Redundant Array of Independent Disk
Remote Management Capability	Ability to launch management software from a remote location.
RG	Redundancy Group
SAN	Storage Area Network
SCSI	Small Computer Standard Interface
SDM	Storage Device Management
SES	SCSI Enclosure Services
ServiceGuard	HP-UX software that coordinates two servers and directs the other server to take over when one fails.
SFF	Small Form Factor
VA	Virtual Array
VAP	Virtual Array Controller
WHQL	Windows Hardware Quality Lab
WWN	World Wide Name
Windows MSCS	Microsoft Cluster Server - Windows software that coordinates two servers and directs the other server to take over when one fails.